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Cover photo by © Monte M. Taylor of Lancaster, California: Sage Thrasher *(Oreoscoptes montanus)*, Indio, California, October, 1992. (Extraneous object removed digitally.)

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WESTERN BIRDS

Volume 28, Number 1, 1997

THE TIMBERLINE SPARROW, *SPIZELLA (BREWERI) TAVERNERI*, IN ALASKA, WITH NOTES ON BREEDING HABITAT AND VOCALIZATIONS

TERRY J. DOYLE, Tetlin National Wildlife Refuge, P. O. Box 779, Tok, Alaska 99780

The Timberline Sparrow was originally described as a full species, *Spizella taverneri*, by Swarth and Brooks (1925), who distinguished it from Brewer's Sparrow, *Spizella breweri*, by its darker color, heavier streaking, and larger average size but smaller, slenderer, darker bill. Subsequently, ornithologists have classified the Timberline Sparrow as a subspecies of Brewer's, though Sibley and Monroe (1990) ranked it as a full species again, on the basis of unpublished differences in vocalizations and ecology.

The published breeding range of *taverneri* extends from southwestern Yukon Territory, northwestern and central British Columbia, and west-central Alberta to southeastern British Columbia and southwestern Alberta (AOU 1957), where it approaches the north end of the range of nominate *breweri*. The winter range is poorly known, with most U.S. specimens taken during migration, in Arizona (Monson and Phillips 1981), New Mexico (Grinnell 1932), Texas (Oberholser 1974), and Washington (Jewett et al. 1953). Only one winter specimen has been reported, from California (Rea 1967), suggesting a winter range south of the U.S.

On 22 June 1992, Jeffrey J. Bouton of the National Park Service found a singing male Timberline Sparrow in the Nutzotin Mountains of Alaska, 100 km northwest of the species' closest known location in Yukon (Clarke 1945, Pamela H. Sinclair in litt.). Over the following four years I studied the occurrence and status of this species in Alaska. I characterized its habitat, recorded songs, and collected specimens (University of Alaska Museum, Fairbanks) to document its occurrence and to help shed light on the relationship between *taverneri* and nominate *breweri*.

STUDY AREA

I searched a 15-km^2 area near Gold Hill from 1993 to 1995 and an 8-km^2 area in the Upper Cheslina drainage from 1994 to 1996 (Figure 1). In addition,

an independent group visited Gold Hill in 1996. Gold Hill is in the Nutzotin Mountains 10 km northeast of Chisana, Alaska (62° 06′ N, 141° 54′ W). The Upper Cheslina drainage is in the Mentasta Mountains 80 km northwest of Gold Hill (62° 39′ N, 142° 44′ W). The Mentasta and Nutzotin mountains are part of the Alaska Range, which extends east to the White River in Yukon (Orth 1971); the Kluane Range continues east of the White River.

Habitats within the Gold Hill and Upper Cheslina areas are similar (Figure 2) and may be described with Kessel's (1979) nomenclature. Unvegetated scree slopes of rugged mountain peaks, elevation 2300–2600 m, descend to rolling foothills of alpine and subalpine vegetation. Mats of dwarf shrubs, <0.4 m high, in the alpine zone give way to subalpine habitat at approximately 1500 m in the Gold Hill area and 1300 m in the Upper Cheslina. The alpine zone descends much lower on north-facing slopes. Subalpine vegetation on south-facing slopes is composed of patchy open and closed thickets of medium willows (*Salix* spp.) and alders (*Alnus crispa*), 1.2–2.4 m high, with Dwarf Birch (*Betula nana*) a common component of the understory. Thickets of low shrubs, 0.4–1.1 m high, dominate the subalpine zone of north-facing slopes. Dwarf spruce (*Picea* spp.) woodlands, <5.0 m high and <20% canopy cover, occur at elevations below the subalpine zone, along with closed thickets of tall willow and alder, 2.5–4.9 m high.

RESULTS

Status in Alaska

Timberline Sparrows were observed in the Gold Hill area each year from 1992 to 1996. Observations included an adult feeding a recently fledged juvenile in 1993 (Figure 3), birds gathering food in 1996, and up to six singing males within 8 km^2 in 1994 (Table 1). A singing male was in the Upper Cheslina drainage in 1994 but not in 1995 or 1996. Elsewhere, a singing male at sea level in southeast Alaska at Hyder, 3–5 June 1996, is the only Alaska record away from the breeding ground.

All but one of the Alaska observations have been during the breeding season, from mid-June to mid-July. A reconnaissance of the Gold Hill area 3–5 June 1995 failed to disclose a single Timberline Sparrow even though all of the regular breeding birds of the area were present (Upland Sandpiper, *Bartramia longicauda*; Say's Phoebe, *Sayornis saya*; Horned Lark, *Eremophila alpestris*; Townsend's Solitaire, *Myadestes townsendi*; American Pipit, *Anthus rubescens*; Orange-crowned Warbler, *Vermivora celata*; Wilson's Warbler, *Wilsonia pusilla*; American Tree Sparrow, *Spizella arborea*; Savannah Sparrow, *Passerculus sandwichensis*; White-crowned Sparrow, *Zonotrichia leucophrys*; Smith's Longspur, *Calcarius pictus*). A later trip, 25–26 June 1995, revealed three Timberline Sparrows in locations where they had been present in prior years. The earliest that Swarth (1936) found the sparrows in the Atlin region of British Columbia was 29 May, and recent arrivals near Whitehorse, Yukon, have been from 29 to 31 May (Cameron D. Eckert, Pamela H. Sinclair in litt.). The observation at Hyder in early June suggests that the birds are still migrating at that time. It is not surprising that the Timberline Sparrow arrives relatively

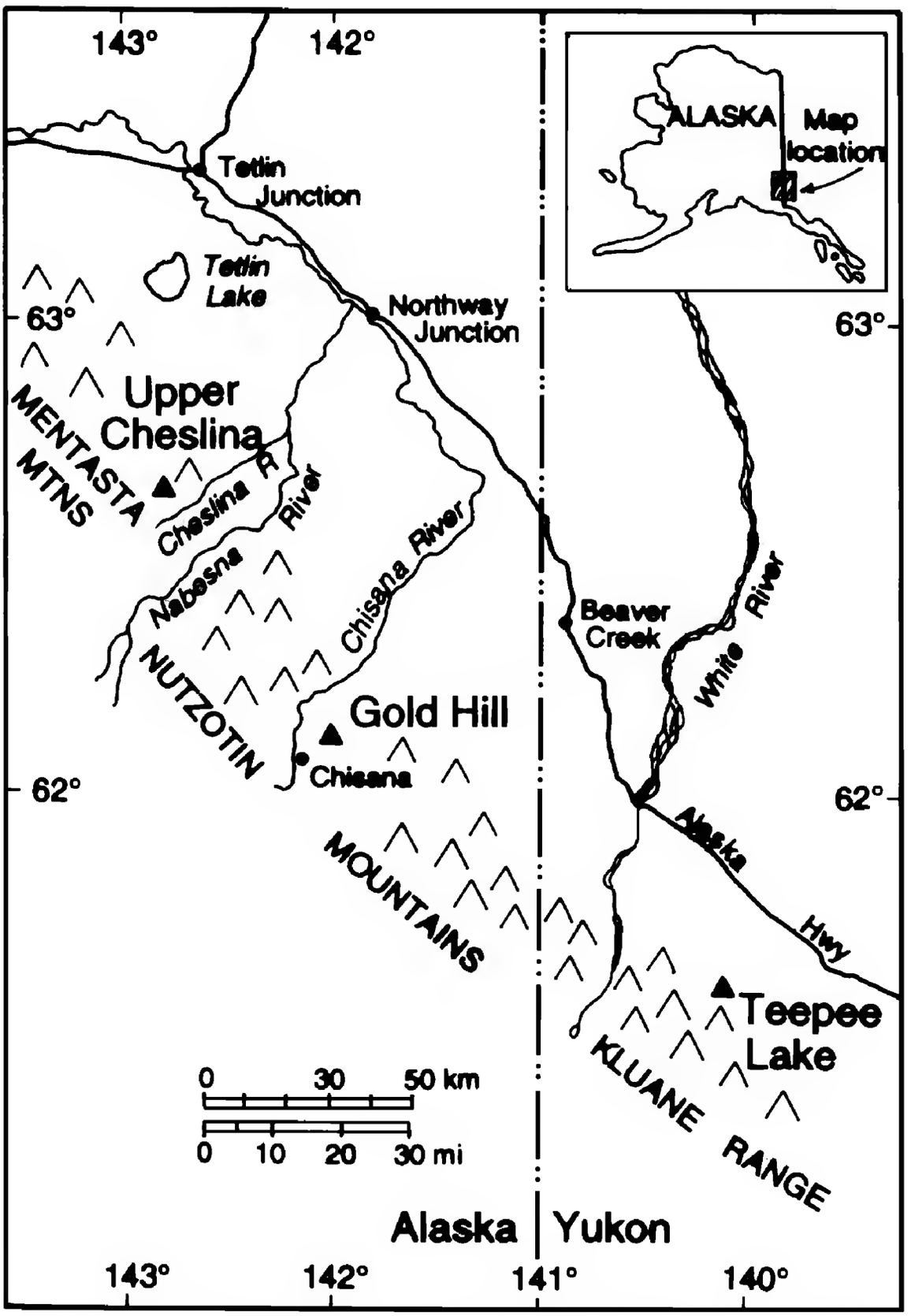

Figure 1. Locations of Timberline Sparrow records in Alaska and adjacent Yukon Territory are denoted by solid triangles.

late in the Gold Hill area, given that the known breeding range in Alaska is farther north than that in Yukon and British Columbia.

Despite the sparrows' late arrival on the breeding ground, their singing seemed to diminish by early July. The latest that they were found singing was

Figure 2. Breeding Timberline Sparrows in Alaska were found on south-facing slopes at the transition of the alpine and shrubby subalpine zones. The habitat in which they were found almost exclusively was thickets of shrubby willows 1.0–1.2 m high with a Dwarf Birch understory 0.4–0.5 m high. This habitat did not occur on north-facing slopes within the area studied, as seen on the right side of this canyon.

Photo by Terry J. Doyle

4 July. Three were seen but not heard singing in the Gold Hill area from 2 to 17 July, and the singing male in the Upper Cheslina drainage was not heard three weeks later, on 15 or 16 July.

Departure dates are unknown, but Swarth (1936) found Timberline Sparrows on the breeding grounds near Atlin, British Columbia, until early September.

Habitat

I found breeding Timberline Sparrows in Alaska to be restricted to a narrow band at the transition between the subalpine and alpine zones, vegetated with low to medium thickets of willows (Figure 2). Average canopy height ranged from 1.0 to 1.2 m, canopy cover from <25% to 50%. *Salix glauca* was the dominant willow; *S. planifolia* and *S. brachycarpa* were less common. Dwarf Birch was the primary component of the next tallest shrub layer, with *Vaccinium uliginosum* and *Potentilla fruticosa* as subdominants. Average canopy height of this layer was 0.4–0.5 m, and canopy cover was <25%–75%. Ground cover included *Rhododendron lapponicum*, *Salix reticulata*, *Poa* sp., *Carex* sp., *Mertensia* sp., and trace amounts of ferns, mosses, and lichens.

Figure 3. This adult Timberline Sparrow was feeding a recently fledged juvenile at Gold Hill on 17 July 1993, providing the first documented record for Alaska.

Photo by David W. Sonneborn

All Timberline Sparrows were found on rather steep (30–40°) south- to southeast-facing slopes at 1460 to 1525 m in the Gold Hill area and at 1325 m in the Upper Cheslina. Below this elevation shrubs are taller and canopies more closed; above, the vegetation quickly changes to mats of dwarf shrubs. Timberline Sparrows were found in contiguous bands of willow thickets rather than in small patches of willows. Some individual Timberline Sparrows appeared to prefer the micro relief in ravines, which has also been observed in Yukon (Cameron D. Eckert pers. comm.). No Timberline Sparrows were found on north-facing slopes, which lack the medium-height thickets of willows.

The habitat in which Timberline Sparrows occurred was quite predictable. I flew over the Gold Hill area in 1994 in a fixed-wing aircraft and identified potential Timberline Sparrow habitat on the basis of the prior year's field work. All potential Timberline Sparrow habitat, within the 15 km^2 surveyed on the ground, had singing males in 1994. No Timberline Sparrows were found outside the identified habitat. In 1995 I identified potential Timberline Sparrow habitat from a fixed-wing aircraft over a 4600-km^2 area in the Mentasta and Nutzotin mountains from northwest of the Upper Cheslina drainage to the Yukon border. Approximately 61 linear kilometers of potential habitat were identified, the majority between Gold Hill and the Canadian border. Several areas more extensive than those investigated in this study were identified, as were several small patches <1 km long. Nearly all identified habitat was on steep south-facing slopes, consistent with that found at Gold Hill and the Upper Cheslina.

Table 1 Dates, locations, and observers of Timberline Sparrow sightings in Alaska.

Date	Location	Observations	Oberservers
22 June 1992	Gold Hill	One singing male	Jeffrey J. Bouton
17 July 1993	Gold Hill	Adult feeding a recently fledged juvenile	T. J. Doyle, Philip D. Martin, David W. Sonneborn
18–19 June 1994	Gold Hill	Six singing males	T. J. Doyle
24 June 1994[a]	Upper Cheslina	One Singing male	T. J. Doyle, Ryan C. Means
25-26 June 1995[b]	Gold Hill	Three singing males	T. J. Doyle, Gary H. Rosenberg
3–5 June 1996	Hyder	One singing male	T. J. Doyle
2–4 July 1996	Gold Hill	Four birds, two singing males and two gathering food	Cari E., Kevin H., and Robert E. Gill, Colleen M. Handel, Lisa J. Oakley, Theodore G. Tobish, Margaret M. Vacca

[a]No birds were found in the Upper Cheslina 15–16 July 1994, 27–29 June 1995, or 26 June 1996.

[b] No birds were found in the Gold Hill Area 3–5 June 1995.

The migrant bird in Hyder was found in scattered shrubs and Sitka Spruce (*Picea sitchensis*), up to 2 m tall, along a gravel causeway adjacent to a saltgrass meadow.

Plumage and Morphometric Comparison

Specimens collected (UAM 6669, 6670, and 6939) for this study agree with *taverneri* and differ from nominate *breweri* in being slightly larger with a more slender bill that is much darker (Figure 4). Measurements of the three Alaska specimens of *taverneri* (all males) were weight 11.8–13.7 g, wing chord 64–66.5 mm, and tail length 56–64.6 mm, in comparison to weight 9.8–11.5 g, wing chord 60.6–64.5 mm, and tail length 58.5–67.0 mm for the 10 male *S. b. breweri* reported by Swarth and Brooks (1925). The plumage of *taverneri* is darker overall with wide dark brown dorsal streaks on a dark gray ground color, in contrast to lighter and narrower brown streaks on a sandy brown ground color in *breweri* (Figure 5); in many plumage characteristics such as its coarser dorsal streaking, fairly well defined grayish nape, suggestion of a median line through the crown, and fairly distinct superciliary, *taverneri* is intermediate between *breweri* and the Clay-colored Sparrow (*S. pallida*).

Song

The songs of *breweri* and *taverneri* are superficially similar. Both are complex songs composed of a variety of trills at different pitches and tempos. Closer examination, however, reveals differences (Figure 6). I

Figure 4. Lateral comparison of two *S. b. breweri* from Utah and Wyoming and three *S. (b.) taverneri* from Alaska (left to right, UAM 2300, 2904, 6939, 6669, and 6670), showing *taverneri* as larger with a more slender, darker bill and a fairly distinct superciliary.

Photo by Barry J. McWayne

compared four songs of an individual *taverneri* (Library of Natural Sounds 73301, Cornell University) to three songs of *breweri* from Wyoming, California, and Oregon (Peterson 1975). I identified 10 different parts in the three songs of *breweri*. They tend to be more buzzy, and parts of them (Figure 6, 1b) resemble the buzzy notes of the Clay-colored Sparrow's song from Peterson (1975). A series of descending sweet notes is the only part repeated (Figure 6, 2) and has no similar counterpart in *taverneri*. The

Figure 5. Dorsal comparison of two *S. b. breweri* from Utah and Wyoming and three *S.* (*b.*) *taverneri* from Alaska (left to right, UAM 2300, 2904, 6939, 6669, and 6670), showing *taverneri* as larger with coarser dorsal streaking, a fairly well defined grayish area between streaking of the head and back, and a suggestion of a median line through the crown.

Photo by Barry J. McWayne

Timberline Sparrow's song contains seven distinct segments, many of which were repeated during the same or subsequent bouts. It tends to have more trills similar to those of a junco (Figure 6, 1a), with some as high-pitched as a waxwing's call. The trills of *breweri* are of a wider frequency range (Figure

6, 1b) than those of *taverneri*, accounting for their buzziness. The most similar part of the two forms' songs is a two-toned trill that varies in pitch and tempo; that part of the *breweri* song (Figure 6, 3b) falls within the range performed by *taverneri* (Figure 6, 3a).

Playback of the *taverneri* song in the Gold Hill area produced a more aggressive response of Timberline Sparrows than did playback of the *breweri* song.

DISCUSSION

The Timberline Sparrow appears to be an annual breeding member of the Alaska avifauna. It is locally distributed and uncommon in suitable habitat. How long it has occurred in Alaska is unknown. Given that there are records from Yukon within 45 km of Alaska, potential habitat in adjacent Alaska, and the remoteness of the area, it is most likely that Timberline Sparrows were simply overlooked until recently.

More extensive breeding habitat probably exists away from the areas investigated in this study. I suspect that the Timberline Sparrow is more widespread in Alaska with breeding populations occurring along the Nutzotin Mountains from Gold Hill to Yukon. The breeding range probably extends northwest of the Gold Hill area into the Mentasta Mountains, perhaps northwest of the Upper Cheslina drainage, where some limited habitat has been identified. Though the habitat may be more extensive than is currently known, it appears restricted to the edge between alpine and subalpine habitats, on primarily south-facing slopes. There are no immediate threats to this habitat, most of which is located on National Park Service and National Wildlife Refuge lands.

The habitat in which *taverneri* occurs in Alaska differs subtly from that in other parts of its range, but dramatically from that of nominate *breweri*. In Alaska the breeding habitat of *taverneri* is farther above timberline than in British Columbia where the bird was first discovered (Swarth 1926) and in some areas in Yukon where it is known currently. At the southern end of its range, *taverneri* is associated primarily with Dwarf Birch (Bruce W. McGillivray in litt.) rather than willows, and occurs at higher elevations (Jon C. Barlow pers. comm.). At these southern latitudes, Dwarf Birch at higher elevations is similar in structure to the willows associated with *taverneri* in Alaska (Jon C. Barlow pers. comm.). The montane habitat in which *taverneri* is found is quite different from the sagebrush steppes (*Artemisia* spp.) with which *breweri* is associated (Wiens and Rotenberry 1981).

Though superficially similar, upon close examination the songs of *taverneri* and *breweri* seem quite different and should be easily distinguishable in the field. Only a few individuals were compared during this investigation. A more thorough study of the geographic variation in song might shed light on the taxonomic status of *taverneri*. In addition, a genetic analysis of *taverneri* and nominate *breweri* may be helpful in defining their taxonomic status. Preliminary genetic work is currently being conducted (Robert M. Zink in litt.).

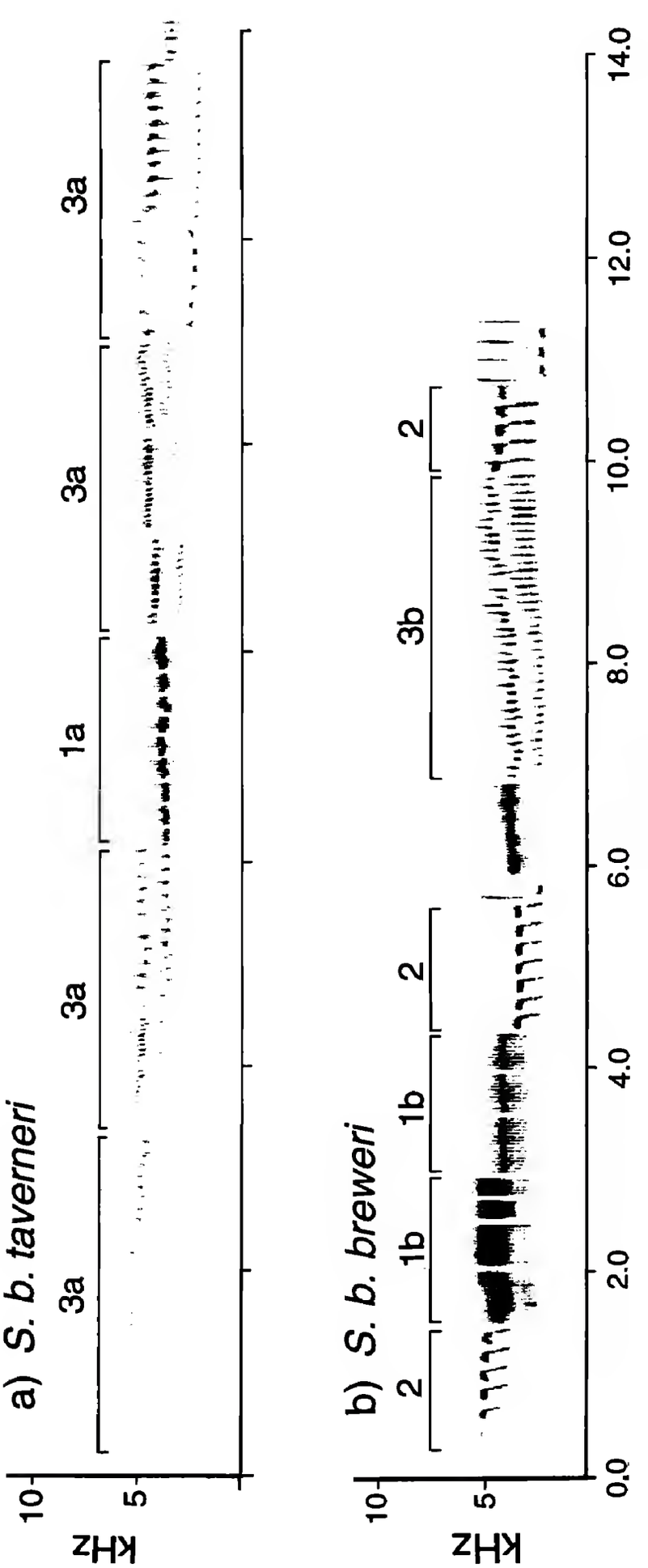

Figure 6. Sonogram of the extended song of *S. (b.) taverneri* from Alaska (top, Library of Natural Sounds 73301, Cornell Univ., UAM 6670) and *S. b. breweri* from Oregon (bottom, Peterson 1975). The trills of *breweri* (1b) are of a wider frequency range than those of *taverneri* (1a), accounting for their buzziness. The *breweri* song contains a series of descending sweet notes (2) for which there is no similar counterpart in the *taverneri* song. The most similar part of the song is a two-toned trill that varies in pitch and tempo; that part of the *breweri* song (3b) falls within the range performed by *taverneri* (3a).

SUMMARY

One of the most recent additions to Alaska's breeding avifauna is the Timberline Sparrow, *Spizella* (*breweri*) *taverneri*, first discovered in 1992 in the Nutzotin Mountains, 100 km northwest of the nearest known location in the Yukon Territory. Follow-up surveys revealed the Timberline Sparrow to be uncommon and local. Up to six individuals, including an adult feeding a fledgling, were within 15 km^2 each year from 1992 to 1996. An additional singing male was found 80 km northwest of the Nutzotin Mountain location, and a singing male was found in migration at Hyder. Timberline Sparrows were limited to a narrow band of open thickets of low to medium shrubs at the transition of the alpine and subalpine zones, quite different from the arid lowland sagebrush habitat with which breeding *breweri* is most often associated. The habitat, although fairly limited, appears to be quite predictable. The song of *taverneri* differs from that of *breweri* in being higher pitched, having less buzzy trills, and lacking descending sweet notes.

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THE TIMING AND RELIABILITY OF BILL CORRUGATIONS FOR AGEING HUMMINGBIRDS

GREGOR M. YANEGA, PETER PYLE, AND GEOFFREY R. GEUPEL, Point Reyes Bird Observatory, 4990 Shoreline Hwy., Stinson Beach, California 94970 (address correspondence to second author)

The extent of corrugation on the bill has proven a useful method in determining the age of hummingbirds (Ortiz-Crespo 1972, Stiles 1972, Baltosser 1987, Russell 1996). Nestlings and postfledging juveniles have soft bills with deep corrugation, covering 50% or more of the bill, whereas adults have harder bills with little or no corrugation. Presumably, the corrugation is lost by a combination of the bill-hardening process and wear, but little has been published on the mechanics or timing of corrugation loss. If hummingbirds retain at least some corrugation at the base of the bill beyond the first prebasic molt (at which point juveniles assume adult plumage; Bent 1940, Stiles 1972, Baltosser 1987), our ability to age them through or beyond the first annual cycle could be enhanced.

To investigate the rate of bill smoothing, we selected the Anna's Hummingbird (*Calypte anna*) because of its year-round abundance in California, being well represented both in museum collections and in the banding records of the Point Reyes Bird Observatory (PRBO). The extremely protracted breeding season of this species, late December through spring and sporadically through summer (Bent 1940, Yanega unpubl. data), results in wide variation in the age of individuals (thus, extent of bill smoothing) on a given date, obscuring precise estimates of smoothing rates in individual birds. Therefore, we also examined bill corrugation in the Rufous Hummingbird (*Selasphorus rufus*), which has a shorter breeding season, late April to mid-July (Calder 1993).

METHODS

Our analysis is based on 496 Anna's Hummingbirds (146 museum specimens, 350 banding records) and 218 Rufous Hummingbirds (131 museum specimens, 87 banding records). Specimens of all Anna's and most Rufous Hummingbirds were from the collections at the California Academy of Sciences (CAS), Moore Laboratory of Zoology (MLZ), Museum of Vertebrate Zoology (MVZ), and PRBO. To augment our sample of fall and winter Rufous Hummingbirds (collected in Mexico), we also examined specimens at the Natural History Museum of Los Angeles County (LACM), San Diego Natural History Museum (SDNHM), and Western Foundation of Vertebrate Zoology (WFVZ). Specimens of Anna's Hummingbirds were taken from throughout the species' breeding range, although a majority were collected in the San Francisco Bay area. Banding records were compiled from 1980 to 1993 at PRBO's Palomarin field station north of San Francisco (DeSante and Geupel 1987).

On each bird, the proportion of the ramphotheca (lateral surfaces of the bill) that contained corrugation (Ortiz-Crespo 1972, Baltosser 1987) was

estimated to the nearest 5% (see Figure 1). Scoring of banded birds was performed by numerous banders at PRBO. Scoring of specimens was performed by Yanega (all Anna's and most Rufous Hummingbirds) and Pyle (42 specimens of the Rufous Hummingbird). Prior to Pyle's scoring, data collection was standardized by comparing scores of both observers on > 50 specimens at CAS, until estimates by each observer differed by no more than 10%.

We independently aged and sexed each specimen by plumage and flight-feather shapes (Williamson 1956, Stiles 1972, Baltosser 1987, Russell 1996, Pyle et al. in press). Juveniles can be separated from adults through at least the prebasic molt, which occurs from May to October in Anna's Hummingbird and from September to January in the Rufous Hummingbird (Pyle et al. in press); some male Anna's Hummingbirds also can be aged through their second prebasic molt by incomplete gorgets or retained flight feathers (Russell 1996, Pyle et al. in press).

Smoothing rates were calculated by means of linear regressions. We incorporated date as the dependent rather than the independent variable to predict the mean smoothing duration of an individual rather than that of the entire population (Pimm 1976). Quadratic date terms (date^2) were incorporated into regressions to assess the linearity of the relationship between corrugation loss and time. Regression equations combined with "forecasted" standard deviations (Computing Resources Center 1992) were used to

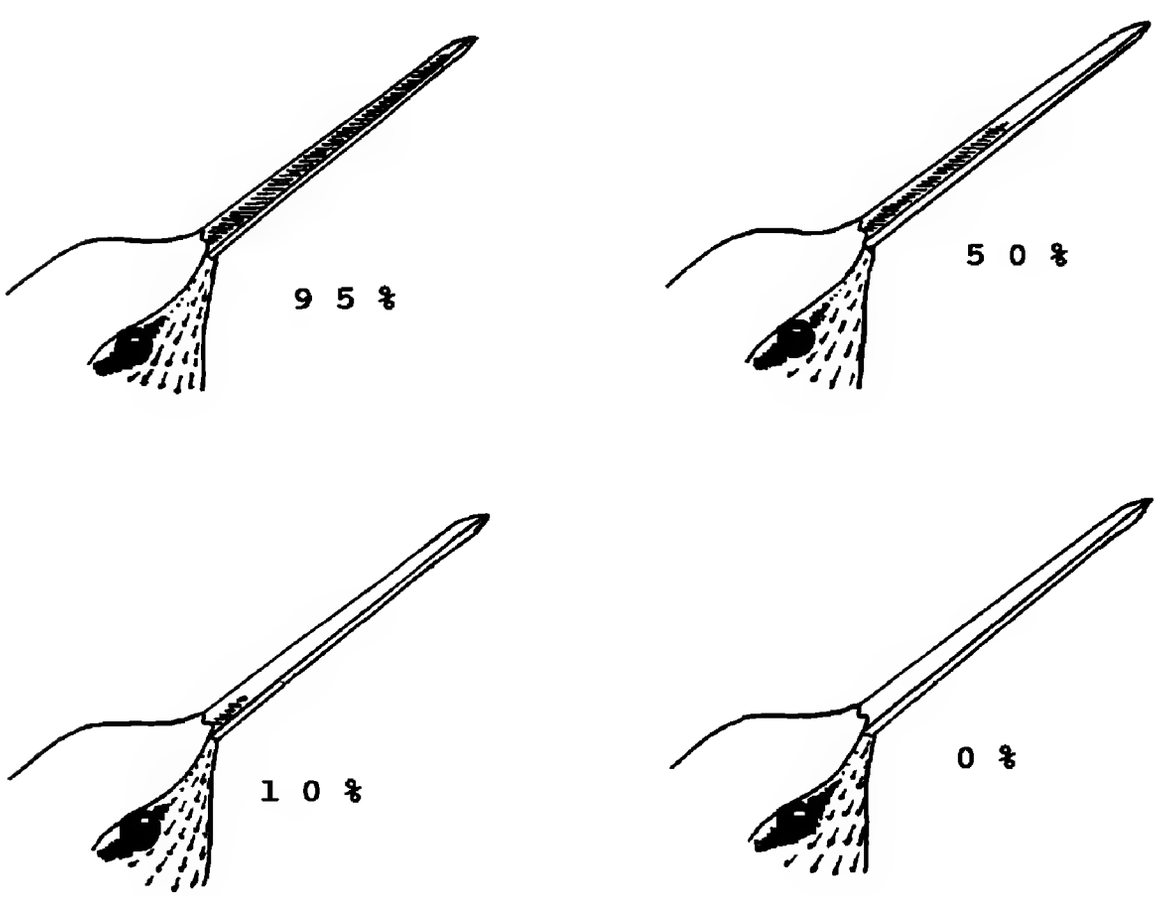

Figure 1. Hummingbird bills with different proportions of corrugation.

predict 95% confidence intervals for dates in which first-year birds complete the smoothing process.

RESULTS

Retention of Bill Corrugation in Adults

Previous studies have assumed that adult hummingbirds lose bill corrugation entirely, or at most retain only superficial notching at the base of the bill. Our data show that Anna's Hummingbirds beyond 12–15 months of age can retain corrugation on up to 10% of the bill. Of 23 banded birds recaptured at Palomarin and known to be >14 months old, 14 had 0% corrugation, six had 5% corrugation, and three had 10% corrugation. One bird (band 24569), a female captured as a juvenile on 6 June 1981, still retained 10% corrugation when it was recaptured on 28 March 1984, at age 33–39 months. In another sample of banding records, of 45 birds (mostly males) in adult plumage between 15 July and 15 October (thus being >12 months old), 23 had 0% corrugation, 13 had 5% corrugation, eight had 10% corrugation, and one was recorded with 15% corrugation. In a similar sample of 36 museum specimens, 28 had 0%, six had 5%, and two had 10% corrugation. A plot of all banding and specimen data points (Figure 2), furthermore, indicates that Anna's can have 5–10% corrugation at any time of year. Finally, of 18 adult-plumaged male Rufous Hummingbirds collected from August to February (thus at least 12 to 18 months old), 15 had 0%

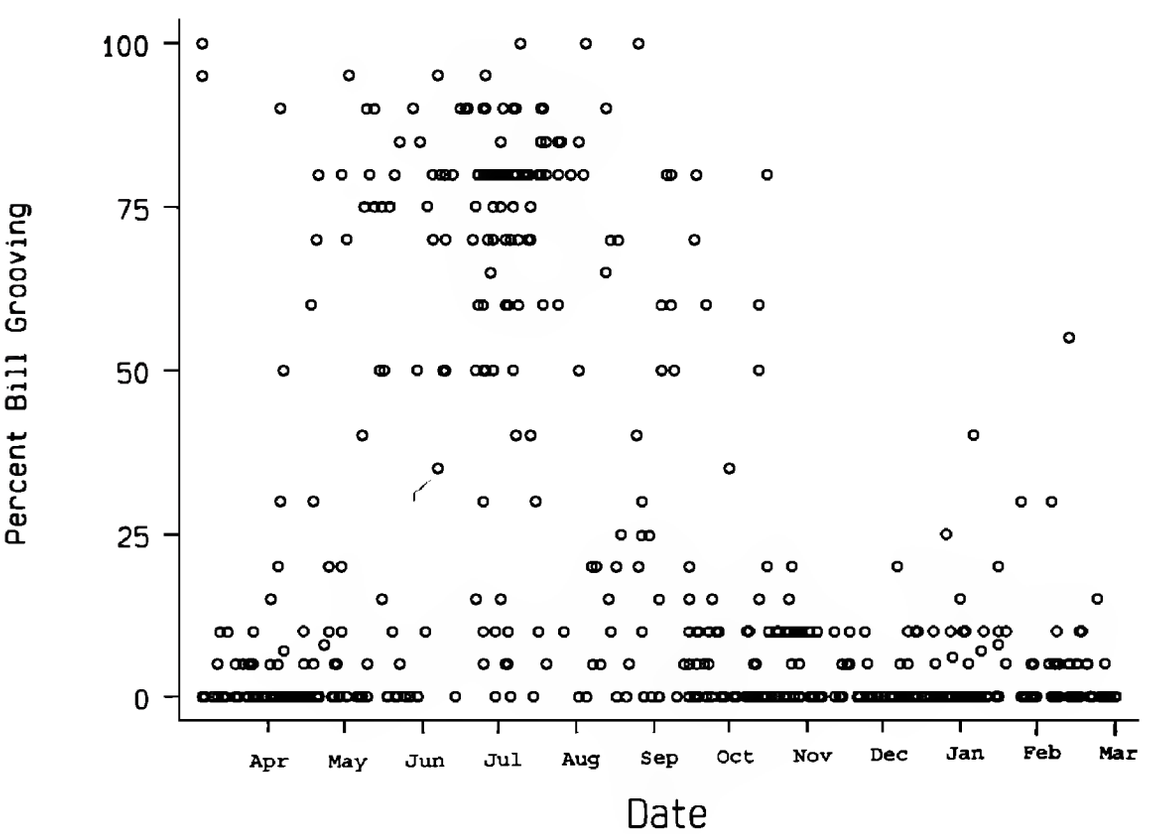

Figure 2. Corrugation proportions by month in Anna's Hummingbirds.

corrugation, two had 5% corrugation, and one had 10% corrugation. We conclude that adults of both species can retain up to 10% corrugation, with <5% of adult birds retaining a higher percentage. Thus 10% serves as a threshold, above which first-year birds can be separated from adults with over 95% confidence.

Bill Smoothing in Young Birds

We estimated the rate of bill smoothing from regression analyses using birds independently aged as juvenile or second-year by plumage (Figure 3). On the basis of the entire data set, linear terms for both species were highly significant ($t = -6.09$, $P < 0.001$, $n = 194$ for Anna's Hummingbird; $t = -12.613$, $P < 0.001$, $n = 91$ for the Rufous Hummingbird), whereas quadratic terms for both species were insignificant ($t = -1.18$, $P = 0.239$ for Anna's; $t = 1.15$, $P = 0.250$ for the Rufous), indicating a linear relationship between corrugation loss and time. Similar levels of significance were found for all comparisons using specimens only.

The predicted mean date for first-year birds to reach 10% corrugation was 3 November ± 22 days for Anna's Hummingbird and 25 February ± 13 days for the Rufous Hummingbird. Thus, on the basis of all data, 95% (estimated as mean ± twice the standard deviation) of Anna's Hummingbirds reach 10% corrugation between 20 September and 17 December and 95% of Rufous Hummingbirds reach 10% corrugation between 31 January and 23 March. When just the specimen data were used, these predicted dates were 26 October ± 17 days (95% range 22 September–29 November) for Anna's and 23 February ± 12 days (95% range 31 January–19 March) for the Rufous.

We inferred hatching dates on the basis of egg and nest data from Bent (1940), Pitelka (1951), Calder (1993), Russell (1996), and Yanega (unpubl. data) and by assuming an average incubation period of 14 days (Bent 1940, Yanega unpubl. data). For Anna's Hummingbird the estimated mean hatching date was 6 March; for the Rufous it was 5 June. Thus, from hatching, we estimate the mean duration of bill smoothing (to 10% corrugation) in Anna's to be 234–242 days (7.5 to 8 months), and in the Rufous, 264–266 days (8.5 months).

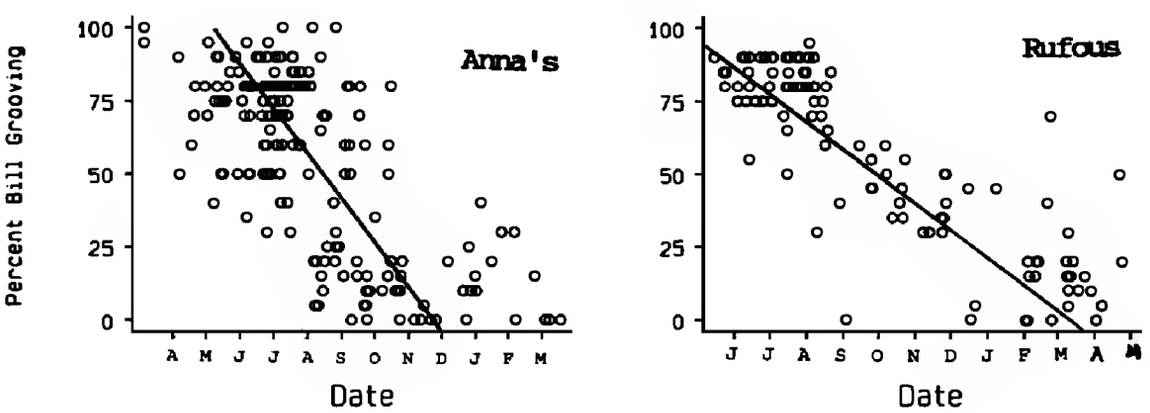

Figure 3. Corrugation proportions by month in first-year Anna's and Rufous Hummingbirds. Regression lines indicate the estimated smoothing rates for individuals.

DISCUSSION

A potential problem with our banding data involves the use of multiple observers in scoring bill corrugation. Results from museum skins, scored primarily by Yanega, however, corroborate the banding records, although smaller proportions of adults were found with 5–10% bill corrugation. Many adults have small markings at the base of the bill that may or may not be equated with the corrugation found in juveniles (W. H. Baltosser, S. M. Russell pers. comm., pers. obs.). Other adults (approximately 20% of our museum specimens), however, do appear to retain up to 10% corrugation at the base of the bill. Similarly, W. H. Baltosser (pers. comm.) found that seven of 54 (13%) adult Black-chinned Hummingbirds (*Archilochus alexandri*) retained small amounts (<10%) of corrugation.

Our calculations of 7.5 to 8.5 months post-hatching (or 6.5 to 8.0 months post-fledging) for mean completion of bill smoothing (to 10% corrugation) should be used with discretion and, if possible, confirmed by study of marked birds in the field. On the basis of unquantified data from banded birds, Russell (1996) and W. H. Baltosser (pers. comm.) estimated completion of bill smoothing to be 5 to 6 months in most Anna's and Black-chinned hummingbirds, respectively. Our longer estimated completion rates could reflect biases in our corrugation estimates (particularly those of banded birds taken by multiple observers), imprecise estimates because of the wide variation in timing of the breeding seasons (especially for Anna's Hummingbird), and geographic or species-specific variation in the smoothing rates, resulting from differences in energetics, migratory strategy, and/or feeding behavior. Our data were taken mostly from populations of hummingbirds breeding in relatively cool and moist environments, where smoothing rates may be slowed by the higher energy demands for thermoregulation or, perhaps, the softer vegetation resulting in less bill wear. It is also possible that smoothing rates differ from year to year within a species (see Stiles 1973). Further quantitative study on corrugation in hummingbirds breeding in warmer and drier habitats could shed light on geographic and species-specific variation in bill-smoothing rates.

From our results, at least small proportions of first-year Anna's and Rufous hummingbirds can be distinguished by bill corrugation beyond the completion of first prebasic molts, typically by November in Anna's and by February in the Rufous (Williamson 1956, Calder 1993, Russell 1996, Pyle et al. in press). We conclude that birds with >10% corrugation can be reliably aged first-year in Anna's through at least mid-December (less frequently through January) and in the Rufous through at least mid-March (less frequently through mid-May). Birds with <10% corrugation can be reliably identified as adults through 20 September in Anna's and 30 January in Rufous. Consideration of plumage should always be combined with that of the bill corrugation in determining age of hummingbirds (Pyle et al. in press).

SUMMARY

In both Anna's and Rufous hummingbirds, a small percentage (13–20%) of adults retain up to 10% bill corrugation for at least 1.5 to 2 years.

Regression analyses indicate that the mean time period in which young birds of both species reach 10% corrugation (at which time they cannot be aged by the bill) is 7.5 to 8.0 months from hatching in Anna's Hummingbird and 8.5 months from hatching in the Rufous Hummingbird. Although our calculated rates are somewhat imprecise and may be affected by geographic variation, we propose that at least a small proportion of first-year birds, with bill corrugation >10%, can be recognized as such up to two months beyond completion of the first prebasic molt.

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NEW INFORMATION ON GULLS IN SOUTHEASTERN ALASKA

STEVEN C. HEINL, P. O. Box 23101, Ketchikan, Alaska 99901

The community of Ketchikan is located on Revillagigedo Island near the southern terminus of the Alexander Archipelago, just north of Dixon Entrance and the adjacent open ocean, in southeastern Alaska (Figure 1). This portion of Alaska is characterized by steep, densely forested islands and high annual rainfall, with small communities isolated by water and limited road systems. Historically, the southern portion of the Alexander Archipelago has been visited by few ornithologists (Gabrielson and Lincoln 1959) and currently has few resident observers. Little information concerning the avifauna of this part of Alaska has been published since Kessel and Gibson (1978).

I documented the movements of gulls through the Ketchikan area from 1990 to 1996. From late June through September, commercial fish processors pump substantial amounts of fish waste into the bay at Ketchikan, luring hordes of migrating gulls. Gulls also gather at this time to feed on spawned-out salmon at several creeks and fish hatcheries in the Ketchikan area (the Ketchikan dump also attracted large numbers of gulls throughout the fall and winter months until its closure in 1995). Up to 20,000 gulls take

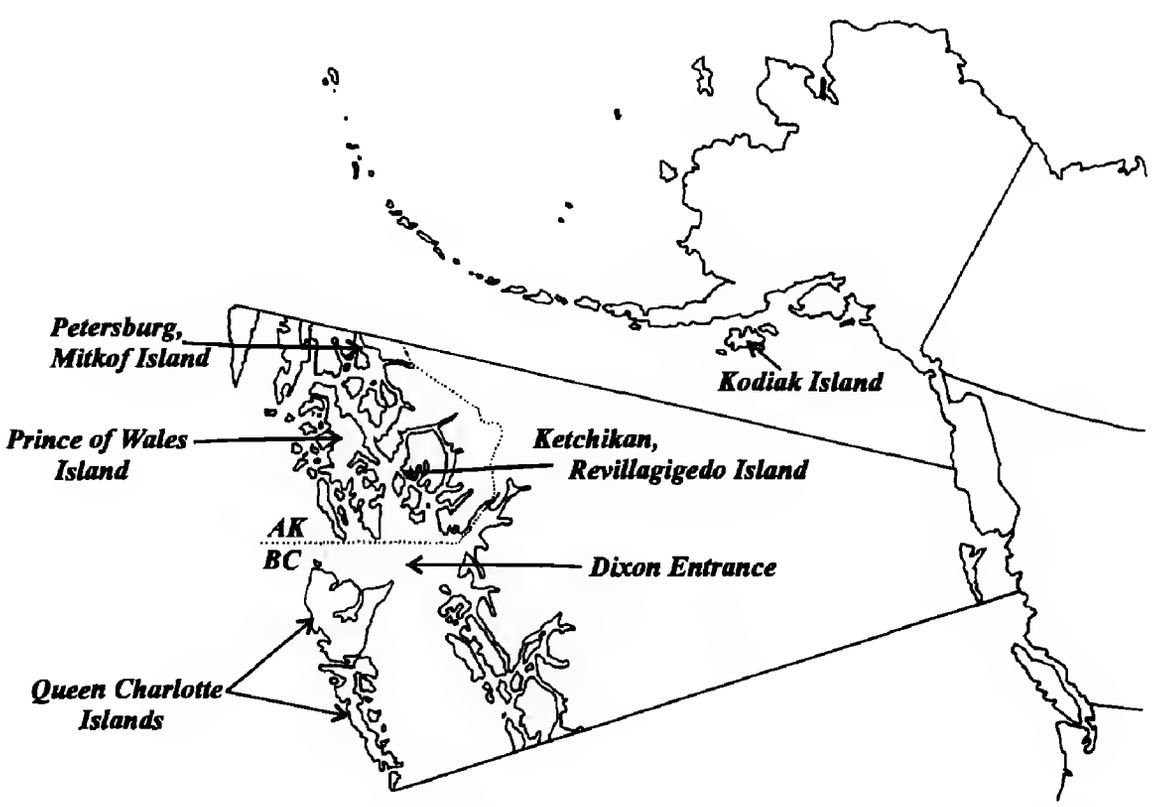

Figure 1. The southern portion of the Alexander Archipelago of southeastern Alaska, showing the location of Ketchikan, Revillagigedo Island, and its proximity to other locations mentioned in the text.

advantage of these food sources during the peak of fall migration. Conversely, commercial fish-processing is greatly reduced in the spring, limiting the food available to gulls. Migrating gulls then concentrate at the spring spawning areas of the Pacific Herring (*Clupea harengus)* and Eulachon (*Thaleichthys pacificus*), which are remote from the Ketchikan waterfront. As a result, fall is the best time for studying gulls in the Ketchikan area, and nearly all of the following data are from that season.

It is well known that the breeding populations and ranges of gulls in the Pacific Northwest have expanded steadily since the 1960s as these highly adaptable birds take advantage of increased food sources and available habitat brought about by human activity (Campbell and Foottitt 1972, Conover et al. 1979, Cannings et al. 1987, Binford and Johnson 1995, etc.). Since 1990 I have found Franklin's (*Larus pipixcan*), Ring-billed (*L. delawarensis*), California (*L. californicus*), Western (*L. occidentalis*) and hybrid Western × Glaucous-winged (*L. glaucescens*) gulls to be annual fall visitants to the Ketchikan area and in greater numbers than was previously reported. The seasonal distribution of these species at Ketchikan corresponds directly with their fall occurrence in much larger numbers on the southern British Columbia coast (Campbell 1990), suggesting that numbers of these species have also been increasing in southeastern Alaska during the past several decades and that these changes have gone unnoticed largely because of the historic lack of year-round coverage of the Ketchikan area or the adjacent British Columbia coast.

Here I present new information both for those species of gulls previously unknown or considered rare in southeastern Alaska and for those species whose status in southeastern Alaska has not been treated fully in previous literature. The seasonal status presented for each species follows Kessel and Gibson (1978) and are generally defined as follows: common—the region regularly hosts large numbers of the species; fairly common—the region regularly hosts substantial numbers of the species; uncommon—the region regularly hosts relatively small numbers of the species; rare—the species occurs nearly annually but in very small numbers; casual—a species beyond its normal range that may occur irregularly over a period of years and in very small numbers.

Specimens, photos, and written documentation pertaining to the records discussed below are on deposit at the University of Alaska Museum, Fairbanks (UAM).

SPECIES ACCOUNTS

FRANKLIN'S GULL *Larus pipixcan*. Rare fall migrant and casual summer visitant. Prior to 1990 there were nine Alaska records of the Franklin's Gull (Gibson et al. 1987). Only two of these were from the fall season, including one at Ketchikan 10–20 September 1986 (T. G. Tobish, R. L. Scher, and M. E. Isleib). Since 1990, I have recorded at least 17 Franklin's Gulls in the Ketchikan area. One to four occur annually during fall migration (6 August–2 October; UAM 6147, 31 August 1992, M. E. Isleib, and UAM 6957, 28 August 1996), with the majority found in late August and early September (maximum three birds on 10 September 1994; Figure 2). All fall records are of birds molting from juvenal to first-winter plumage, with the exception of a second-summer bird on 30 August 1992. I have found the Franklin's Gull twice in the

Figure 2. First-winter Franklin's Gull at Ketchikan, one of three birds present on 10 September 1994.

Photo by Steven C. Heinl

summer at Ketchikan (first-summer bird 24 June 1991; second-summer bird 17 July 1994). Elsewhere on the south coast of Alaska the Franklin's Gull is a casual spring, summer, and fall visitant (Kessel and Gibson 1978; UAM unpublished records). Though this species is a common fall migrant on the southern British Columbia coast, one fall record for the Queen Charlotte Islands appears to be the only coastal British Columbia record north of Vancouver Island (Campbell et al. 1990).

BONAPARTE'S GULL *Larus philadelphia*. Common migrant and uncommon summer visitant (Gabrielson and Lincoln 1959); casual winter visitant. This species generally departs by December, but it has lingered into the winter twice at Ketchikan (three birds 21 January–27 February 1992; numbers through mid-January 1994, with a maximum of 110 on 13 January). A Bonaparte's Gull at Petersburg, Mitkof Island, 4 January 1987 (P. J. Walsh in litt.) provided the first Alaska winter record, and 13 birds were also recorded there on 15 January 1994 (P. J. Walsh in litt.). These are the only mid-winter Alaska records.

HEERMANN'S GULL *Larus heermanni*. Casual fall visitant. Single first-year Heermann's Gulls photographed at Ketchikan 22 August 1991 (Gibson and Kessel 1992) and 16 August–23 September 1994 provided the first Alaska records. Post-breeding dispersal brings this species north annually to southern coastal British Columbia, where it is an abundant summer and fall visitant, but there are apparently few records in British Columbia north of Vancouver Island (Campbell et al. 1990).

BLACK-TAILED GULL *Larus crassirostris*. The Black-tailed Gull has been recorded twice at Ketchikan. I observed a second-summer bird on five different days during the period 21 August–8 October 1992 (Figure 3). On the last date the bird had nearly completed the molt to adult basic plumage (a color photo was published in *Am. Birds* 47:166, 1993). The second record for Ketchikan was of an adult observed on 5 July 1993. Possibly this same adult Black-tailed Gull was subsequently observed at

Figure 3. Second-summer Black-tailed Gull, with Mew Gulls, at Ketchikan, 30 August 1992. This bird was present from 22 August to 8 October 1992. Note that the bird is only slightly larger than the accompanying Mew Gulls and has a bill proportionately long and heavy for its size. The mantle is dark slate-gray, noticeably darker than the adjacent Mew Gulls'. The eyes are small and distinctively whitish. This bird also had black rectrices that were broadly tipped white, and the outermost rectrices were edged white. The short legs were pale green, similar to those of a nonbreeding California Gull.

Photo by Steven C. Heinl

Petersburg, Mitkof Island, 160 km north of Ketchikan, on 1 August 1993 (P. J. Walsh in litt., photo on file at UAM). Prior to 1992 this species had been recorded only four times in Alaska, and all records were from the western Aleutian Islands and St. Lawrence Island in the Bering Sea region (Gibson and Kessel 1992). In addition, there is a sight record from the nearby Queen Charlotte Islands, British Columbia, on 22 November 1991 (Siddle 1992).

RING-BILLED GULL *Larus delawarensis*. Uncommon to fairly common fall migrant, very rare spring migrant and summer visitant. The Ring-billed Gull occurs annually in the fall (25 July–19 October; two UAM specimens), with numbers peaking from late August to early September. High counts are typically of fewer than 10 birds, though the species occurs in larger numbers in some years (maxima 30 on 2 September 1992, 24 on 21 August 1994, and 31 on 31 August 1996). Numbers decrease sharply after the first week of September. The fall movement consists almost entirely of birds molting from juvenal to first-winter plumage (e.g., 27 of 30 birds on 2 September 1992, and 23 of 24 birds on 21 August 1994). There are no winter records, and I believe that a bird at Ketchikan on 2 December 1974 (M. E. Isleib; Kessel and Gibson 1978) was a late fall migrant. The Ring-billed Gull is a very rare visitant during the spring and summer in the Ketchikan area. There are only three spring records, of one 24–30 April 1990, one 8 May 1993, and two 15 May 1979 (J. C. and R. C. Tweit; Gibson 1979). Two to four subadults, June–July 1993, represent the only summer records. Away from the Ketchikan area the Ring-billed

Gull occurs on the Alaska coast only in ones and twos as a rare migrant and summer visitant and a casual winter visitant, from Petersburg, Mitkof Island, north and west to Kodiak Island; it is casual in summer farther west to the Alaska Peninsula (Isleib and Kessel 1973, Kessel and Gibson 1978; UAM unpublished records).

CALIFORNIA GULL *Larus californicus californicus*. Common fall migrant, casual winter visitant, and uncommon spring migrant and summer visitant. The California Gull was first reported in Alaska by Willett (1923b), who salvaged a dead specimen at Craig, Prince of Wales Island, on 21 September 1921, and Bailey (1927), who collected four specimens at Klawock, Prince of Wales Island, on 10 March 1921. Kessel and Gibson (1978) considered the California Gull to be a rare and local summer visitant in extreme southeastern Alaska (maximum 70 birds at Wrangell 27 July 1974, D. D. Gibson and S. O. MacDonald), but its full status remained unclear because of insufficient year-round coverage. The California Gull has since proven to be common in the fall at Ketchikan (19 July–25 November), with numbers peaking in late August and early September. Maximum counts typically reach 200–400 birds. This species occurred in exceptional numbers in 1992 and 1996, however, peaking at 2000+ on 2 September 1992, and 2100 on 31 August 1996. The California Gull has also been recorded in numbers elsewhere in extreme southeastern Alaska during the fall: 300 birds at Traitors' Cove, Revillagigedo Island, 4 September 1996; 300 birds at Forrester Island 14 September 1992 (M. E. Isleib in litt.); 120 birds at Hyder 23 September 1992; and 300 at McDonald Lake, Cleveland Peninsula, 30 September 1996. As in the case of the Ring-billed Gull, first-year birds make up the vast majority of the fall migrants.

I have found this species twice in the winter at Ketchikan (third-winter bird, 14 December 1991–11 January 1992; first-winter bird, 14 December 1991–24 January 1992). One at Sitka in late January 1987 constitutes the only other mid-winter Alaska record (M. W. Schwan; Gibson et al. 1987). Small numbers are found annually during spring migration in extreme southeastern Alaska at Prince of Wales Island (10 March–25 May; maximum 75 on 1 May 1994 near Thorne Bay, M. A. Archie pers. comm.; Bailey 1927) and around Ketchikan (13 March–20 May; maximum 10 on 2 May 1995). The majority of spring migrants are adults in breeding plumage. As expected, subadult birds constitute the majority of the summer visitants (maximum 10 at Ketchikan, 26 June 1993).

The California Gull is a casual to locally rare spring, summer, and fall visitant elsewhere on the southern Alaska coast from Petersburg, Mitkof Island, north and west as far as Kodiak Island (Kessel and Gibson 1978; UAM unpublished records). Clearly, the waters of extreme southeastern Alaska represent the northern end of this species' range of annual post-breeding dispersal in numbers on the Pacific coast. On 25 October 1993, I found a banded third-winter California Gull at Ketchikan and read the band number through a spotting scope. The bird had been banded as a nestling near Silver Springs, Nevada, on 15 June 1991. Such northwesterly post-breeding dispersal is well documented at Vancouver, British Columbia, where banded California Gulls arrived from 12 breeding colonies in eight western states (Oldaker 1960, 1963). Banded California Gulls from the Canadian Great Plains have also been recovered during fall and spring migration at Vancouver, British Columbia (Oldaker 1961, 1963). These birds are of the recently described subspecies *L. c. albertaensis*, which breeds in the Northwest Territories, Alberta, Saskatchewan, Manitoba, and North Dakota (Jehl 1987). All but one of the sixteen California Gull specimens at UAM have been identified as nominate *californicus* by D. D. Gibson (including twelve recent August–September specimens from the Ketchikan area). The one UAM specimen of *albertaensis* was taken at Wrangell 27 July 1974 (Kessel and Gibson 1978). While it appears that *californicus* predominates in the Ketchikan area during the fall, it is likely that small numbers of *albertaensis* also occur—more field work is needed to determine the relative abundance and seasonal distribution of each form.

HERRING GULL *Larus argentatus smithsonianus*. Gabrielson and Lincoln (1959) reported this species to be a common migrant, uncommon winter visitant, and rare summer visitant in southeastern Alaska. While this is still generally true today, it should be noted that nearly all Herring Gulls found during the winter at Ketchikan exhibit signs of hybridization with the Glaucous-winged Gull (*Larus glaucescens*). Herring Gulls hybridize extensively with Glaucous-winged Gulls on the southern Alaska coast in Cook Inlet and at Glacier Bay (Williamson and Peyton 1963, Patten and Weisbrod 1974), producing a continuum of phenotypes between the parent species. The characteristics I use to identify adult birds as hybrids rather than pure Herring Gulls include combinations of brown irides, pink-red orbital rings, reduced black in the outer primaries, slight darkening of the gray mantle color, and slightly heavier build. Hybrids begin appearing in the Ketchikan area in early October and outnumber pure Herring Gulls by early November. Few pure Herring Gulls are to be found through the winter (e.g., all of the 50 dark-primaried birds recorded on 30 November 1992 and 29 December 1994 were hybrid Glaucous-winged × Herring gulls). Hybrids depart the area by the end of March, at which time northbound pure Herring Gulls are again common in southeastern Alaska.

THAYER'S GULL *Larus thayeri*. Common fall migrant, fairly common winter visitant and spring migrant. The status of the Thayer's Gull in southeastern Alaska has not been fully treated since Willett (1923a), who found it wintering in numbers at Craig, Prince of Wales Island (24 September–24 March). Fall migrants arrive annually at Ketchikan by the third week of August (earliest 16 August 1994), and numbers peak in mid to late September (maximum 1500, on 18 September 1991 and 16 September 1993). During that time this species often represents fully two-thirds of the large gulls in the Ketchikan area. The fall movement is composed almost entirely of adults, still largely in breeding plumage when they arrive (this species remains white-headed into mid-September, long after most Herring Gulls have developed streaks on the head and neck). Only one to three first-year birds are seen daily through fall migration and the winter months (earliest 9 September 1991). Up to 100 birds are found through the winter on the Ketchikan waterfront in some years; most of these depart by the end of March. As noted above, migrating gulls are attracted to remote food sources in the spring. While the Thayer's Gull is a common spring migrant through southeastern Alaska, only a few are found daily at that season at Ketchikan (latest 17 May 1991).

SLATY-BACKED GULL *Larus schistisagus*. Rare fall migrant and very rare winter visitant. I have recorded 18 Slaty-backed Gulls at Ketchikan, finding the species annually in fall since 1990 (14 birds, 19 August–17 December; one specimen, adult female UAM 6888, 29 October 1994; Figures 4 and 5), with the majority occurring from late October to early December (maximum three, 4 November 1993). Presumably most of these birds dispersed to winter elsewhere. There are six winter records (two of which involve birds lingering from the fall season): a first-winter bird 3–20 February 1992 (UAM 5970, D. Bowers, S. C. Heinl); an adult 27 October 1993–19 March 1994; an adult 27-29 January 1994; an adult 27 January–16 February 1994; a second-winter bird 25 October 1994–24 January 1995; and an adult 10 January 1995.

There are only three other southeastern Alaska records, of two at Juneau in mid-August of 1990 (including adult male UAM 5701, M. E. Isleib) and one at Haines 12–13 November 1993 (C. D. Eckert; Tobish 1994). This Beringian species is a rare to locally uncommon visitant at any season in western Alaska (Kessel and Gibson 1978, Kessel 1989), a rare summer and fall visitant on the arctic coast east to Prudhoe Bay (Johnson and Herter 1989, Hohenberger et al. 1994), and a casual summer and winter visitant and very rare fall visitant to southcoastal Alaska east to Prince William Sound (Isleib and Kessel 1973; UAM unpublished records). The recent pattern of fall Slaty-backed Gull records at Ketchikan clearly indicates a dispersal of very small numbers to

Figure 4. Adult-winter Slaty-backed Gull at Ketchikan, 28 October 1993. This bird was present from 27 October 1993 to 19 March 1994. Note the slate gray back color and the heavy, straight bill, which lacks the pronounced gonydeal swelling of the Western and Glaucous-winged gulls. Winter adults typically have a two-toned bill, with a dull yellowish tip and a pinkish cast to the basal two-thirds of the bill (usually entirely yellow in an adult winter Western Gull). Also characteristic of this species is the blackish patch around the eye, causing the yellow eye to stand out on the face from some distance. The streaking on the head and neck is brown (reddish-brown in some birds).

Photo by Steven C. Heinl

the northeast Pacific coast 2600 km east of the Bering Sea, and annually places the species much closer to the increasing number of winter records to the south and east elsewhere in North America (Goetz et al. 1986, Campbell et al. 1990, Gilligan et al. 1994, Gustafson and Peterjohn 1994) than has been previously reported.

WESTERN GULL *Larus occidentalis occidentalis*. Very uncommon fall migrant, rare winter visitant, and casual spring migrant. All "Western Gulls" recorded to date in the Ketchikan area are of the northern subspecies *occidentalis*, and nearly all have exhibited some degree of hybridization with the Glaucous-winged Gull. Characteristics of adult birds indicating hybridization with the Glaucous-winged Gull include combinations of paler gray mantle color, pink orbital rings, brown irides, reduced extent of black in the outer primaries (particularly on the inner webs of the feathers), and often extensive gray streaking on the head and neck in basic plumage (Figure 6). The two species hybridize extensively along the coast of Washington and northwest Oregon (Hoffman et al. 1978), producing a continuum of phenotypes (see also Weber 1981). Given the rarity of the Western Gull in Alaska (only one record prior to 1990; Kessel and Gibson 1978) and the difficulty in identifying birds as either Western Gulls or hybrids, I have conservatively identified birds as Western Gulls only when they are at the dark extreme for *L. o. occidentalis*. In the Ketchikan area seemingly pure Western Gulls are very rare and are far outnumbered by Glaucous-winged × Western

Figure 5. Third-winter Slaty-backed Gull at Ketchikan, 6 November 1993. This bird was present in the Ketchikan area from 29 October to 6 November 1993. It features many of the same field marks as the adult in Figure 4, including the slate-gray mantle color, the yellow eye surrounded by a black patch, and the heavy, straight bill. Although this bird was in sub-adult plumage, it still exhibited the white subterminal crescents on the sixth to eighth primaries characteristic of this species (see Goetz et al. 1986).

Photo by Steven C. Heinl

hybrids (see below). The fact that "Western-type" gulls (Western Gulls and hybrids) occur regularly in southeastern Alaska is significant in itself, perhaps more important than the often impossible task of attempting to determine in the field which birds are pure and which are not.

"Western-type" gulls occur annually in the fall (19 August–late November), with most found from mid-October to mid-November (maxima five 23 October 1992, six 27–29 October 1993). The falls of 1992, 1993, and 1994 saw the greatest numbers, with all age classes recorded: at least 18 birds 26 August–6 November 1992; 15 birds 21 August–16 November 1993; and up to 12 birds 15 September-26 November 1994 (including adult female hybrids UAM 6889 and 6906, both 29 October 1994). Of the 45+ birds recorded during those three years, I considered only six to be pure Western Gulls. Two to four birds are recorded nearly annually during the winter months (one specimen, first-winter male Western Gull, UAM 6907, 19 January 1995). "Western-type" gulls usually depart by the end of March, and there are few spring records beyond that time (latest three 15–17 May 1990 and one 6 May 1995 at nearby Annette I.). Two birds have been identified returning to southeastern Alaska during consecutive years. One adult hybrid, missing half of one leg, has returned to Ketchikan and Petersburg, Mitkof Island, for four consecutive falls since 1992 (26 July–6 November, pers. obs. and P. J. Walsh pers. comm.), and another adult hybrid wintered on the same dock in Ketchikan, 1990–1993.

The Western Gull is very rare along the British Columbia coast north of Vancouver

Figure 6. Adult-winter Glaucous-winged × Western Gull at Ketchikan 29 December 1994. The head and neck of this bird are heavily streaked and barred gray, indicating a hybrid. This bird had pink orbital rings (should be yellow in Western Gull), and in flight the outer primaries showed much less black on the inner webs than does a pure Western Gull—from below the bird's outer primaries looked dark gray instead of black.

Photo by Steven C. Heinl

Island (Campbell et al. 1990) and has been recorded only five times in southeastern Alaska away from Ketchikan—all since 1990 between 17 July and 22 September (UAM unpublished records, including adult male Western Gull UAM 6256, 22 September 1992, Forrester I., M. E. Isleib). This species has also been reported recently on the southern coast of Alaska at Kodiak Island and the Kenai Peninsula (UAM unpublished records). While Glaucous-winged × Western gulls have not been reported elsewhere in Alaska, observers should keep in mind that the probability of finding hybrids is *much* greater than that of finding pure Western Gulls.

GLAUCOUS GULL *Larus hyperboreus barrovianus*. Very uncommon migrant and winter visitant. Gabrielson and Lincoln (1959) did not report this species in southeastern Alaska, and Kessel and Gibson (1978) did not cover it. Glaucous Gulls typically appear in Ketchikan by the first week of October, occasionally earlier (adult on 28 August 1992; second-winter on 30 August 1996; one on 13 September 1994 was still molting out of juvenal plumage and surprisingly early for that age class). Small numbers winter in the Ketchikan area through late March (maxima eight on 9 December 1990 and 10 on 24 January 1992; latest, first-summer bird, 14–17 May 1991). Analysis of 53 records shows that first-winter birds outnumber all other age classes combined 3:1. A specimen salvaged at Ketchikan on 3 March 1995 (unsexed second-winter, UAM 6890) is an example of *barrovianus*—the expected wintering race on the Pacific coast of North America (Banks 1986).

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RARE MIGRANTS IN CALIFORNIA: THE DETERMINANTS OF THEIR FREQUENCY

STEVE HAMPTON, 19-D Solano Park, Davis, California 95616

As autumn-weekend crowds of birders at Point Reyes, California, attest, the state regularly receives thousands of wayward migrating birds each year, representing over a hundred species. The vast majority of these birds are neotropical migrant passerines whose breeding ranges are in Canada and the eastern United States and whose primary migration route is east of the Rocky Mountains. While the trees at the lighthouse may be dotted with Blackpoll Warblers, the rare appearance of a Golden-winged Warbler or a Red-eyed Vireo is sure to draw much greater attention. What is it that makes some species so much more "common" than others? What characteristics of each species determine the frequency of their appearances?

In this paper, I develop and evaluate a model, employing multiple regression analysis, that explains the frequency of 84 species of eastern birds in California. The model attempts to explain vagrancy as a function of various characteristics of each species' range and migration patterns as well as its population size and taxonomic classification. This analysis is limited to autumn occurrences of migrant passerines and woodpeckers from eastern North America (as opposed to species from Siberia or the American Southwest) in northern California.

The results allow conclusions to be drawn about range expansions of certain species, species birders may be missing though the birds are present, the notion of "mirror-image misorientation," and evolutionary adaptations in certain species.

A few previous studies have addressed the question of the frequency of eastern vagrants on the West Coast. These studies have relied on general observations or pairwise correlations (comparing only two variables at a time), yet some have suggested that a multiple-variable analysis would address the question more adequately.

DeBenedictis (1971: 123), focusing on vireos and warblers in California, concluded that "a large part of variation in abundance of these 'accidentals' in California can be attributed to differences in population size. The influence of other factors is minimal." These other factors include the migration distance of each species and the angle of deviation between the species' normal migration route and the route that would bring it to California.

DeSante (1973) noted that eastern species with strong easterly, rather than primarily southerly, components to their migration routes are more frequent visitors to California. From experiments with caged Blackpoll Warblers captured on the Farallon Islands, he concluded that mirror-image misorientation (which causes the birds to migrate southwest instead of southeast) is the dominant factor bringing immature warblers to California. He also noted that the majority of vagrants are immatures.

DeSante and Ainley (1980: 87) noted that "nine-primaried passerines, particularly wood warblers, are proportionally more common as vagrants on

the Farallones than 10-primaried passerines with similarly sized source populations and similar breeding ranges and migration routes." These are the species currently grouped in an enlarged family Emberizidae (AOU 1983).

DeSante's (1983) analysis is the most thorough. He reasserted the importance of mirror-image misorientation but also added, "clearly, a large number of very diverse factors must be operative to cause the widely varying abundances of the many landbird species that occur on the Farallones" (p. 843). These factors include the size of the source population, the location of the species' breeding and wintering ranges, migration patterns, and whether the species is an emberizid. His analysis, however, did not consider each species individually. Instead, it grouped all the species covered into two groups ("northern" and "southeastern") and used pairwise correlations only. He concluded the discussion of vagrants by citing the need for multivariate analysis.

METHODS

Following the recommendation of the cited papers, I have developed a multivariate model in which, for each species, the number of individual birds reported during a given period of time is a function of its total population, of how far it migrates, of the westernmost longitude of its breeding range, of the distance from California to its breeding range, of whether it is an emberizid, and of whether or not it has an easterly component to its fall migration path. For each species, the model I propose can be written

$$\#\text{BIRDS} = f(\text{POP, MIG, LONG, DIST, EMB, EAST})$$

where #BIRDS is the number of individuals reported in coastal and central northern California from July to December in the years 1989 through 1995. The Sierra Nevada, Modoc Plateau, and Owens Valley were excluded. For this data, I rely on the wealth of information collected by birders and amateurs who have reported their observations to the Northern California Rare Bird Hotline, which is managed by volunteers from the Golden Gate Audubon Society. In cases where birds on the California Bird Records Committee (CBRC) review list were reported, I have included only accepted records. For species not on the review list or whose reports have yet to be reviewed by the CBRC, I attempted to eliminate suspect reports and to avoid double-counting the same bird in a year. Possibly the same individuals returning to the same spot each year, however, are counted multiple times.

POP represents the total population size of the species. I used a coding system similar to that of DeBenedictis (1971), relying on abundance information for 62 states, provinces, or territories in the United States and Canada in the *Distributional Checklist of North American Birds* (DeSante and Pyle 1986). A score, meant to reflect actual abundance levels, was assigned to each species for each geographical area: 100 points were given for "common," 25 for "fairly common," 5 for "uncommon," and 1 for "rare." Only summer ranges were used. The resulting figures were divided by 20 when DeSante and Pyle indicated that the bird was present in only a limited portion of the territory (defined as less than 10%). The score was

then multiplied by the total land area of the state or province and the scores for all areas were summed, giving an index of the total population in North America. Finally, this index was scaled so that 10 was the maximum score for the most common bird (Eastern Kingbird). Kirtland's Warbler had the lowest score with 0.0003. DeSante and Pyle made clear that their abundance codes do not refer directly to population but to the likelihood of encountering a species while birding. This has the effect of biasing POP up for conspicuous birds and down for secretive birds.

MIG refers to the distance between the species' breeding grounds and wintering grounds. This distance was calculated as the latitudinal gap between the geographical center of these ranges. The figure is given in terms of ten degrees of latitude, so that a value of 4.0 implies that there are 40 degrees latitude between the centers of the breeding and wintering ranges. The National Geographic Society (1987) guide was used for the breeding ranges, while the sixth edition of the AOU checklist (1983) was used for most of the wintering ranges.

LONG refers to a score assigned to each species to represent the westernmost longitude of its breeding range. For species breeding west of 120° W (i.e., into British Columbia or Washington state), zero points were assigned. One point was given for species nesting west to 115° W, two points for 110°W, and so on.

DIST refers to the distance from Sacramento, California, to the nearest edge of the breeding range. The figure is given in miles, divided by 100.

EMB is a dummy variable, with a value of one assigned to the emberizids (warblers, tanagers, grosbeaks, buntings, sparrows, longspurs, and icterids), and zero assigned to all other species.

EAST is also a dummy variable, distinguishing species that seem to have an easterly component to their autumn migration route. A value of one is assigned to species regularly reported from Bermuda (Ralph 1981), those that are most often seen migrating over the Atlantic Ocean (McClintock et al. 1978), and those that migrate primarily around the eastern edge of the Gulf of Mexico, rather than across it or through Texas.

Table 1 lists the complete data for each species (as well as the predicted #BIRDS from the model and the difference between the actual and the predicted total). To gain the greatest possible understanding of why a species occurs as often as it does in California, all eastern migratory woodpeckers and passerines are included (84 species), including those for which there were no reported sightings (e.g., Eastern Wood-Pewee). A 6-year period is used to minimize the effects of unusual years, as well as to include the few occurrences of species that may not show up every year. DeSante (1983) pointed out that while the number of birds may vary from year to year, the relative number of each species does not vary significantly.

The functional form of the equation above affects its modeling ability. In the 6-year period of the sample, many species were reported less than ten times, others over 200 times. Intuitively, we would like the difference between zero sightings and 40 sightings to be more significant than the difference between 200 and 240 sightings. Taking the natural logarithm of #BIRDS achieves this goal. The same logic applies to MIG, LONG, and

Table 1 Input Data and Predictions of a Model Testing Six Factors Contributing to the Occurrence of Eastern Vagrant Land Birds in California

Species	#BIRDS Obs.	Pred.	Error	POP	DIST	LONG	MIG	EMB	EAST
Red-headed Woodpecker *Melanerpes erythrocephalus*	0	0	0	2.47	10	2	0.5	0	0
Yellow-bellied Sapsucker *Sphyrapicus varius*	29	6	23	2.51	12	0	3.0	0	0
Red-naped Sapsucker *S. nuchalis*	15	3	12	0.72	2	1	2.0	0	0
Eastern Wood-Pewee *Contopus virens*	0	1	−1	4.82	12	4	3.5	0	0
Yellow-bellied Flycatcher *Empidonax flaviventris*	0	6	−6	1.08	12	0	4.0	0	0
Acadian Flycatcher *E. virescens*	0	0	0	1.70	15	5	3.0	0	0
Alder Flycatcher *E. alnorum*	0	11	−11	3.53	10	0	6.0	0	0
Least Flycatcher *E. minimus*	37	8	29	5.42	8	0	3.0	0	0
Gray Flycatcher *E. wrightii*	11	5	6	0.28	2	0	1.5	0	0
Eastern Phoebe *Sayornis phoebe*	19	5	14	1.67	10	0	2.5	0	0
Great Crested Flycatcher *Myiarchus crinitus*	1	1	0	4.85	12	3	2.5	0	0
Eastern Kingbird *Tyrannus tyrannus*	25	17	8	10.00	4	0	5.0	0	0
Gray Kingbird *T. dominicensis*	0	0	0	0.13	21	7	1.0	0	0
Scissor-tailed Flycatcher *T. forficatus*	3	1	2	1.02	11	3	2.0	0	0
Blue Jay *Cyanocitta cristata*	0	1	−1	7.90	10	1	0.5	0	0
Sedge Wren *Cistothorus platensis*	1	0	1	0.44	12	3	2.0	0	0
Eastern Bluebird *Sialia sialis*	0	1	−1	2.26	10	3	1.5	0	0
Veery *Catharus fuscescens*	0	13	−13	4.59	4	0	4.5	0	0
Gray-cheeked Thrush *C. minimus*	2	9	−7	3.60	16	0	6.0	0	0
Wood Thrush *Hylocichla mustelina*	0	1	−1	3.07	13	4	2.5	0	0
Gray Catbird *Dumetella carolinensis*	7	6	1	6.25	7	0	1.5	0	0
Brown Thrasher *Toxostoma rufum*	5	1	4	4.45	9	2	1.0	0	0

(continued)

Table 1 *(continued)*

Species	#BIRDS Obs.	Pred.	Error	POP	DIST	LONG	MIG	EMB	EAST
Sprague's Pipit *Anthus spragueii*	0	2	–2	0.77	9	1	2.5	0	0
Black-capped Vireo *Vireo atricapillus*	0	0	0	0.01	14	4	1.0	0	0
White-eyed Vireo *V. griseus*	1	0	1	2.10	13	4	1.5	0	0
Yellow-throated Vireo *V. flavifrons*	1	0	1	0.79	14	5	2.0	0	0
Philadelphia Vireo *V. philadelphicus*	14	3	11	0.62	10	1	3.5	0	0
Red-eyed Vireo *V. olivaceus*	36	60	–24	8.94	6	0	5.0	0	1
Blue-winged Warbler *Vermivora pinus*	3	2	1	0.18	17	6	2.5	1	0
Golden-winged Warbler *V. chrysoptera*	3	3	0	0.12	16	5	2.5	1	0
Tennessee Warbler *V. peregrina*	136	166	–30	4.80	9	0	4.5	1	1
Virginia's Warbler *V. virginiae*	21	11	10	0.74	4	1	1.5	1	0
Northern Parula *Parula americana*	22	21	1	2.32	16	5	3.0	1	1
Chestnut-sided Warbler *Dendroica pensylvanica*	124	9	115	3.33	12	3	3.5	1	0
Magnolia Warbler *D. magnolia*	91	146	–55	3.09	8	0	4.0	1	1
Cape May Warbler *D. tigrina*	17	46	–29	1.17	12	1	2.5	1	1
Black-thr. Blue Warbler *D. caerulescens*	54	15	39	0.68	16	5	2.5	1	1
Black-thr. Green Warbler *D. virens*	12	12	0	3.21	13	1	2.5	1	0
Golden-cheeked Warbler *D. chrysoparia*	0	2	–2	0.01	15	4	1.5	1	0
Blackburnian Warbler *D. fusca*	51	11	40	3.23	13	3	5.0	1	0
Yellow-throated Warbler *D. dominica*	3	2	1	1.31	15	5	1.5	1	0
Kirtland's Warbler *D. kirtlandii*	0	1	–1	0.0003	20	7	2.0	1	0
Pine Warbler *D. pinus*	1	2	–1	0.41	14	5	1.0	1	0
Prairie Warbler *D. discolor*	52	12	40	0.95	15	5	1.5	1	1
Palm Warbler *D. palmarum*	1048	87	961	0.90	12	0	3.0	1	1

(continued)

Table 1 *(continued)*

Species	#BIRDS Obs.	Pred.	Error	POP	DIST	LONG	MIG	EMB	EAST
Bay-breasted Warbler *D. castanea*	15	24	–9	0.66	12	0	4.0	1	0
Blackpoll Warbler *D. striata*	245	199	46	4.81	11	0	6.5	1	1
Cerulean Warbler *D. cerulea*	0	4	–4	0.24	15	5	4.0	1	0
Black-and-white Warbler *Mniotilta varia*	150	116	34	3.42	10	0	3.0	1	1
American Redstart *Setophaga ruticilla*	268	158	110	6.59	6	0	3.0	1	1
Prothonotary Warbler *Protonotaria citrea*	16	3	13	1.08	14	5	2.0	1	0
Worm-eating Warbler *Helmitheros vermivorus*	3	2	1	0.14	15	5	2.0	1	0
Swainson's Warbler *Limnothlypis swainsonii*	0	1	–1	0.09	15	6	1.5	1	0
Ovenbird *Seiurus aurocapillus*	40	114	–74	5.14	10	0	2.5	1	1
Northern Waterthrush *S. noveboracensis*	77	154	–77	4.07	8	0	4.0	1	1
Louisiana Waterthrush *S. motacilla*	0	3	–3	0.47	14	5	2.0	1	0
Kentucky Warbler *Oporornis formosus*	4	3	1	1.12	15	5	2.0	1	0
Connecticut Warbler *O. agilis*	23	14	9	0.25	14	1	5.0	1	0
Mourning Warbler *O. philadelphia*	20	17	3	2.59	13	1	4.5	1	0
Hooded Warbler *Wilsonia citrina*	14	3	11	1.35	15	5	2.0	1	0
Canada Warbler *W. canadensis*	10	54	–44	0.84	15	1	4.0	1	1
Scarlet Tanager *Piranga olivacea*	2	5	–3	1.51	13	5	3.5	1	0
Rose-breasted Grosbeak *Pheucticus ludovicianus*	62	32	30	4.41	11	0	3.5	1	0
Indigo Bunting *Passerina cyanea*	24	11	13	4.98	6	2	2.0	1	0
Painted Bunting *P. ciris*	0	3	–3	0.97	11	4	1.5	1	0
Dickcissel *Spiza americana*	5	5	0	2.25	11	4	2.5	1	0
Clay-colored Sparrow *Spizella pallida*	245	28	217	2.29	8	0	3.0	1	0
Brewer's Sparrow *S. breweri*	40	27	13	2.52	3	0	1.5	1	0
Field Sparrow *S. pusilla*	0	3	–3	3.03	9	3	0.5	1	0

(continued)

Table 1 *(continued)*

Species	#BIRDS Obs.	Pred.	Error	POP	DIST	LONG	MIG	EMB	EAST
Black-throated Sparrow *Amphispiza bilineata*	4	11	−7	2.10	2	1	0.5	1	0
Lark Bunting *Calamospiza melanocorys*	26	7	19	1.34	6	2	1.5	1	0
Baird's Sparrow *Ammodramus bairdii*	1	6	−5	0.22	5	2	1.5	1	0
Henslow's Sparrow *A. henslowii*	0	1	−1	0.04	13	5	1.0	1	0
Le Conte's Sparrow *A. leconteii*	2	7	−5	0.58	11	1	1.5	1	0
Sharp-tailed Sparrow *A. caudacutus*	31	8	23	0.29	12	1	2.0	1	0
Swamp Sparrow *Melospiza georgiana*	370	17	353	4.02	14	0	1.5	1	0
McCown's Longspur *Calcarius mccownii*	0	4	−4	0.32	9	2	1.0	1	0
Smith's Longspur *C. pictus*	2	17	−15	0.38	18	0	3.0	1	0
Chestnut-col. Longspur *C. ornatus*	65	7	58	1.25	7	2	1.5	1	0
Bobolink *Dolichonyx oryzivorus*	74	154	80	2.71	3	1	6.5	1	1
Eastern Meadowlark *Sturnella magna*	0	3	−3	4.71	8	4	0.5	1	0
Rusty Blackbird *Euphagus carolinus*	10	17	−7	1.44	13	0	2.0	1	0
Common Grackle *Quiscalus quiscula*	0	9	−9	8.32	9	1	0.5	1	0
Orchard Oriole *Icterus spurius*	12	6	6	2.07	10	3	2.0	1	0

DIST, where it makes sense to weight the importance of the differences among the lower values. This also requires adding 1 to #BIRDS, as the natural log of zero is negative infinity, while the natural log of one is zero. The same shifting was done for ln(LONG) and ln(MIG), so that they are really ln(#BIRDS + 1), ln(LONG + 1), and ln(MIG + 1).

Thus the final functional form for the model employs a semilog form (see Studenmund 1992) and can be written

$$\ln(\#BIRDS) = \beta_0 + \beta_1(POP) + \beta_2\ln(MIG) + \beta_3\ln(LONG) + \beta_4\ln(DIST) + \beta_5(EMB) + \beta_6(EAST)$$

Multiple regression analysis enables us to find the coefficients (the β's) that give us the best fit. The equation was solved through the use of ordinary least

squares, which can incorporate both continuous and dichotomous (dummy) variables (Studenmund 1992). Moreover, the statistical significance of each coefficient can be tested. It is important to note that this analysis enables us to see the correlation of each variable with #BIRDS, independent of the other variables. That is, each coefficient captures only the effect of one variable, as if the others were held constant. The simple pairwise correlations of previous studies include cross-correlation biases that may be caused by other variables that are ignored when only two variables are considered at a time.

Once the coefficients are generated on the basis of the entire sample, the data from each species may be plugged into the model to obtain the "predicted values," the #BIRDS that the model predicts from the characteristics of that species (see Table 1).

RESULTS AND DISCUSSION

Table 2 lists the results of the regression. All of the coefficients were of the expected signs, implying that all of the variables had the expected impact in bringing these rare migrants to northern California. Most of the variables were significant at the 90% confidence level. The R^2 was 0.57, which roughly means that 57% of the variation in #BIRDS can be explained by this model. Greene (1993:154) stated, "in terms of the values one normally encounters in cross-section data [as opposed to time-series data], an R^2 of 0.50 is relatively high." Other versions of the model were run, deleting the Palm Warbler from the sample, deleting birds that winter in California from the sample, and keeping only emberizids in the sample. The results changed little, though POP and DIST did have t statistics as high as 1.50 in some versions, implying significance at low confidence levels.

Table 2 Coefficients and t Statistics Generated by Multiple Regression Using Ordinary Least Squares of a Model Testing Six Factors Contributing to the Occurrence of Eastern Vagrant Land Birds in California[a]

Variable	Coefficient	t Statistic
POP	0.03	0.36
ln(MIG)	0.80[b]	1.97
ln(LONG)	−0.87[c]	−3.48
ln(DIST)	−0.35	−1.11
EMB	1.31[c]	4.15
EAST	1.45[c]	3.49

[a] $n = 84$, $R^2 = 0.57$, $F = 17.27$

[b] Significantly different from zero, with a 95% confidence level.

[c] Significantly different from zero, with a 99.5% confidence level.

Interpretation of the coefficients is difficult because they vary with the units used for each explanatory variable and because the dependent variable (#BIRDS) is in logarithmic form. The *t* statistic, together with the confidence levels, gives the statistical likelihood that the coefficient is different from zero, that is, that the coefficient has a significant effect on #BIRDS. For example, with a sample size of 84, a *t* statistic greater than 1.66 (in absolute value) implies a 95% confidence level that the coefficient is not zero. The *t* statistics are normalized around zero, and are positive or negative depending on the sign of the corresponding coefficient. The model fits well enough that I address possible explanations for the species that seem to deviate from the model.

The Explanatory Variables

To turn first to the explanatory variables, POP is a statistically insignificant factor in determining the frequency of rare migrants, far from the dominant influence suggested by DeBenedictis (1971). The coefficient of 0.03 implies that an increase in population of 1 unit (on the scale of 0 to 10) should cause the number of sightings to increase about 8%, a level that could be unnoticed, or certainly masked by the growing number of birders that report sightings. Therefore, even with "common" rare migrants, an increase in extralimital sightings may be a poor indicator of demographic changes. Instead, weather conditions, changes in the habitat available in California, or changes in the effort or distribution of birders may be more likely explanations for short-term variations in the number of sightings. Caution must be used in interpreting this variable, however, because the data on which POP is based are relatively crude. Perhaps more exact measures of total bird populations would yield a more significant result.

Whether or not a bird migrates surely affects its frequency of extralimital records. Because nonmigratory species are excluded from the sample (and it is hard to think of a vagrant record for a nonmigratory species), MIG is undoubtedly catching the difference between those species that winter in Central or South America and those that winter in the southern U.S. The coefficient of 0.80 implies that, for every increase of ten degrees of latitude (the latitudinal spread of the state of California) the species migrates, the number of individuals reported in northern California will increase about 75%. It is no surprise that long-distance migrants get lost more than shorter-distance migrants.

LONG focuses on many eastern species' breeding ranges that extend west across Canada, some even to Alaska. Though most of these birds follow an eastern migration route that presumably evolved before the bird expanded its range west, it is not surprising that this condition leads to an increase in these species' appearances on the West Coast. The coefficient of −0.87 implies that 5.2 times more vagrants (i. e., a 520% increase) will be seen for every 10° farther west the species breeds. This variable may lend support to the concept that birds arriving in California from western Canada suffer from mirror-image misorientation (DeSante 1973). While this variable is different from EAST, it may have a similar effect. EAST refers primarily to birds already in eastern North America and whether or

not they migrate over the Atlantic or across the Gulf of Mexico. However, birds in western Canada must fly southeast in autumn just to get to the eastern U.S., and thus have an easterly component to their migration regardless of how they fly farther south. If they are misoriented, they may fly southwest, hit the Pacific Coast, and perhaps hug the coast as they fly south (or head out to sea).

The distance from northern California to the breeding range (DIST) is statistically insignificant. The sample includes some non-eastern species that breed east of the target area (e. g., Brewer's Sparrow, Virginia's Warbler) and some eastern species that breed very close to it (e. g., Eastern Kingbird). If other random factors besides mirror-image misorientation, such as total "disorientation," cause a bird to lose its way, and it can get lost in any direction, we would expect some increase in sightings due merely to proximity to the bird's breeding area. DeSante (1983:843) hypothesized, "It seems likely that all mechanisms of disorientation and misorientation have been responsible, to some degree or another, for the occurrences of vagrant landbirds." My results imply that random disorientation alone is not responsible to any significant degree. The coefficient of –0.35 (which, again, is statistically not different from zero) implies that, for every 500 miles closer to California a species breeds, there should be a 48% increase in sightings.

The very high *t* statistic associated with EMB supports DeSante and Ainley's (1980) observation that the taxonomic status of the species plays an important role in determining the frequency of extralimital records. According to the coefficient of 1.31, an emberizid will be seen about 3.7 times more often than a similar bird of another family. Thus, EMB has an enormous influence and begs the question, why? DeSante and Ainley speculated that the proclivity of these species to get lost is an advanced evolutionary trait that enables these birds to adapt, to find new breeding and wintering grounds and new migration routes. Indeed, virtually all of the species that appear in numbers much larger than expected from this model (as if they were expanding their range) are emberizids.

Finally, EAST, by virtue of its strong significance, adds support to the hypothesis of mirror-image misorientation. The coefficient of 1.44 implies that species that migrate east over the Atlantic or around the Gulf of Mexico through Florida are likely to show up roughly 4.2 times more often on the West Coast than similar species that migrate straight over the Gulf or through Mexico.

Thus the coefficients suggest that both the location of the breeding range (as modeled in LONG) and the distance a species migrates (MIG) play important roles in determining the frequency of vagrancy. However, eastern birds prone to mirror-image misorientation and emberizids will stray to California many times more often than other species, regardless of other factors.

The Outliers

When a model fits well it may be useful to look at the few exceptional observations in the sample, the outliers, and to ask why they do not seem to fit as the others do.

Small deviations from the model may be explained by sampling variation in data collection, which is to be expected. Large deviations and outliers may be explained as the result of either the bird, the birders, or both. Either the species is behaving in a particularly unusual way that causes it to stray to or to avoid California or the birds are behaving as the other species in the model but birders either are finding them more easily than other species or are missing them.

The model predicts quite well for the species with less than 10 sightings, often missing by a single observation (see Table 1). The greatest deviations are for the Alder Flycatcher, Veery, and Common Grackle. The model overpredicts sightings of these birds, predicting 11, 13, and 9 respectively, when none of the three was reported [indeed, there are only two accepted California records of the Alder Flycatcher, Heindel and Patten (1996)]. While numerous and breeding west to British Columbia (at least), Alder Flycatchers, Veeries, and Common Grackles either hardly ever get lost or they reach California but birders are missing them. Birders may miss birds for two obvious reasons: their foraging habits make them difficult to see (because they are hiding, skulking, etc.), or they are difficult to identify. Criteria for identifying the Alder Flycatcher in the field during fall migration have yet to be reported. Veeries may be under-reported because of their foraging habits, identification problems, and/or actual indisposition of *Catharus* thrushes to vagrancy (the Gray-cheeked Thrush too is reported appreciably less often than expected). Common Grackles may be overlooked in a large winter flock of blackbirds. Note that a future report of a single Kirtland's Warbler or Eastern Wood-Pewee would be consistent with the model. Three other more common species that the model overpredicts are the Ovenbird, the Northern Waterthrush, and the Canada Warbler. The relative magnitudes of these overpredictions are much smaller, but a possible answer is that birders are missing them because of these species' foraging habits.

The only other species that are somewhat overpredicted are the Red-eyed Vireo, of which 60 are predicted but only 36 were reported, and the Bobolink, of which 154 are predicted but only 74 were reported. I can suggest no obvious explanations for these anomalies.

Among species greatly underpredicted by the model, three stand out as strikingly different from the others: the Palm Warbler (87 predicted and 1048 reported), the Swamp Sparrow (17 predicted and 370 reported), and, to a lesser extent, the Clay-colored Sparrow (28 predicted and 245 reported). These results suggest that these species should not be considered "out of range" in California. Rather, Palm Warblers and Clay-colored Sparrows appear to have established a new migration corridor and Swamp Sparrows a new wintering ground. If so, sightings of these species may continue to increase. The White-throated Sparrow (*Zonotrichia albicollis*) was not included in the sample because it is a well-established winter visitor in northern California (so much so that many are not reported to the Rare Bird Hotline). The results of this model indicate that the Swamp Sparrow is following a similar path.

Note that the high numbers of American Redstarts, Blackpoll Warblers, Black-and-white Warblers, and Tennessee Warblers are explained by the model. This agreement implies that these species are showing up in the numbers expected for a vagrant, have not established migration routes or wintering ranges in northern California, and show no signs of expanding their migration routes. Four other species of warblers, however, are reported far more often than the model predicts: the Chestnut-sided, Black-throated Blue, Blackburnian, and Prairie. These species may follow in the path of the Palm Warbler.

Finally, the Least Flycatcher, both sapsuckers, and the Chestnut-collared Longspur are sighted far more often in northern California than predicted. For the Least Flycatcher, this may be due to recent range expansion in Washington state. The latter three species winter in the area, providing birders with more time to find them.

The results of this analysis may be tested further with the wealth of data collected on Southeast Farallon Island. Similar models may be applicable to shorebirds, pelagic species, Alaskan and Siberian species, and species of the American Southwest. All of these groups, however, involve much smaller sample sizes with less variation, reducing the strength of interpretation of the results. Studies of larger samples, such of as the vagrancy patterns of western passerines on the East Coast or North American species in Europe, may offer better parallels.

SUMMARY

On the basis of 6 years of reported hotline sightings of vagrant eastern landbirds in northern California and multiple-regression analysis using ordinary least squares, I devised and evaluated a model testing and quantifying six factors contributing to the occurrence of these species on the West Coast: relative abundance, migration distance, western limit of breeding range, distance of breeding range from California, migration route, and membership in the family Emberizidae. The results suggest that there is a quantifiable pattern to the frequency of most eastern vagrants in California. Migration direction, location of breeding range, and taxonomic status of a species each play a significant role in determining the probability of vagrancy. On the other hand, population size may not be an important factor. By quantifying these roles, the model supports the concept of mirror-image misorientation. The model also suggests range expansions by the Palm Warbler, the Swamp Sparrow, and possibly a few other species. It suggests that some species difficult to identify, such as the Alder Flycatcher and Veery, are being missed by birders.

ACKNOWLEDGMENTS

I am very grateful to Joseph Morlan for recording the data from the northern California rare-bird alert and for providing me access to it. Any mistakes in calculating #BIRDS are purely mine. I also thank John Kemper, Alvaro Jaramillo, Philip Unitt, David DeSante, and Scott Terrill for their encouraging and helpful comments on earlier drafts.

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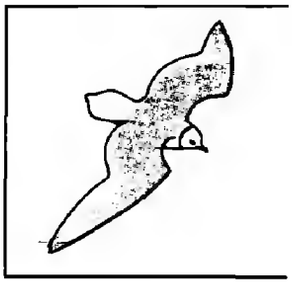

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PRESIDENT'S MESSAGE

As another year end we can take stock of some of the accomplishments and challenges of our organization. The Colorado Field Ornithologists put on a great meeting last June in Estes Park, which WFO was honored to have co-hosted. Our thanks go to Steve Bouricius and the other hard-working CFO members who put together a gathering full of figurative and literal high points. From the art of ptarmigan-noosing to the fine points of geographical variation in western Marsh Wrens, the field trips and presented papers had something for everybody. The WFO Board of Directors met in Estes Park, and among the many issues that emerged was a desire to place greater emphasis on the scientific program at future meetings. Toward this end, we've schedules our 1997 meeting where we're assured a captive audience in our air-conditioned lecture rooms: the Imperial Valley in August! After early morning birding on Friday and Saturday 23–23 August, we're planning a full afternoon indoor program emphasizing the ornithology of the Salton Sea and adjacent desert regions of the southwestern United States and northwestern Mexico. We'll also hold a workshop on California's breeding-bird atlases, as well as our annual identification panel and related presentations on the fine points of field identification. Then it's back in the field on Sunday, 24 August. Please plan to join us at Imperial's Airporter Inn for our biggest and most ambitious meeting ever.

Our biggest challenge remains increasing our membership; every one of you must know a number of active field ornithologists or serious birders who should become members of WFO. Please show them the journal, give a gift membership, and encourage them to join us in the Imperial Valley in August.

This is an appropriate occasion to recognize the contributions and hard work of Michael Patten, who has served as secretary of the California Bird Records Committee since 1991 and will relinquish that role at the next CBRC meeting. Michael, like his predecessors Don Roberson, Mike Parmeter, John Luther, and Jon Winter, has maintained the highest standards for the committee and made it a model throughout North America. Changes in committee membership and by-laws due at the committee's January 1997 meeting will be reported in this journal. Work continues on a book summarizing the CBRC's decisions through detailed species accounts. We thank the Western Foundation of Vertebrate Zoology for archiving the CBRC records and for hosting several recent committee meetings.

We hope to have a WFO/CBRC home page up and running on the World Wide Web sometime during the first half of 1997; visitors to this site will be able to keep current with CBRC decisions, the table of contents of *Western Birds*, news of upcoming WFO meetings and events, and many other items relating to field ornithology in western North America and the eastern Pacific Ocean.

I would like to conclude this message with a special thanks to three people who hold this organization together. Phil Unitt and Ginger Johnson continue to do a masterful job with *Western Birds*, not only ably editing the journal, but overseeing a hard-working team to produce it. Please get your friends, colleague, and libraries to subscribe to this enlightening journal of field ornithology. And when they do subscribe, all of the work on the financial and circulation side is the domain of Dorothy Myers, our dynamic treasurer, circulation director, and membership secretary. Thank you Phil, Ginger, and Dori!

Please don't hesitate to contact me about our organization. Write, or send an e-mail message to garrett@bcf.usc.edu.

Kimball L. Garrett

Wing Your Way to . . .

Western Field Ornithologists'

22nd Annual Meeting

IMPERIAL VALLEY, CALIFORNIA

21–24 August 1997

at the Airporter Inn in Imperial, adjacent to the Imperial County airport, 3 miles north of El Centro, and near the south end of the Salton Sea.

Field trip destinations on Friday, Saturday, and Sunday mornings include many sites around the Salton Sea and throughout the Imperial Valley. Air-conditioned minivans will be available!

Target species include the Wood Stork, Fulvous Whistling Duck, Yellow-footed Gull, Laughing Gull, Gull-billed Tern, Black Skimmer, Stilt Sandpiper, and many others. The meeting takes place at the peak of waterbird migration, when tens of thousands of shorebirds, Black Terns, and more converge on the Salton Sea. Plus, the timing maximizes our chance of finding frigatebirds, boobies, or other wanderers for which the Salton Sea region is famed.

Because of the high summer temperatures in Imperial County, our field trips will take place in the morning only, and our meetings and scientific presentations will be spread over two afternoons and evenings, Friday and Saturday. In addition, Friday evening features a workshop on bird atlases and the notorious identification panel, Saturday our evening banquet.

Our scientific presentations will focus on the ornithology, biology, and conservation of the Salton Sea area and nearby desert regions. Several well-known field ornithologists have already committed to speak, but we welcome additional speakers. If you would like to present at the meeting, please contact Philip Unitt (San Diego Natural History Museum, P. O. Box 1390, San Diego, CA 92112) or Kimball Garrett (Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007).

Address for registration and correspondence concerning other aspects of the meeting: WFO conference, IVC Desert Museum, P. O. Box 430, Ocotillo, CA 92259.

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The California Bird Records Committee of Western Field Ornithologists recently revised its 10-column Field List of California Birds (June 1996). The last list covered 578 accepted species; the new list covers 592 species. Please send orders to WFO, c/o Dori Myers, Treasurer, 6011 Saddletree Lane, Yorba Linda, CA 92886. California addresses please add 7.75% sales tax.

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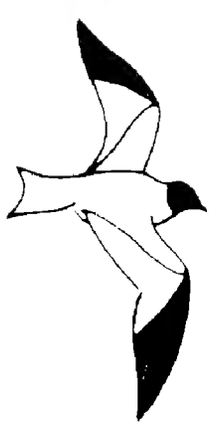

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Cover photo by © Richard Ditch of Phoenix, Arizona: Eared Trogon *(Euptilotis neoxenus)* Christopher Creek, Arizona, November, 1995.

Western Birds solicits papers that are both useful to and understandable by amateur field ornithologists and also contribute significantly to scientific literature. The journal welcomes contributions from both professionals and amateurs. Appropriate topics include distribution, migration, status, identification, geographic variation, conservation, behavior, ecology, population dynamics, habitat requirements, the effects of pollution, and techniques for censusing, sound recording, and photographing birds in the field. Papers of general interest will be considered regardless of their geographic origin, but particularly desired are reports of studies done in or bearing on the Rocky Mountain and Pacific states and provinces, including Alaska and Hawaii, western Texas, northwestern Mexico, and the northeastern Pacific Ocean.

Send manuscripts to Philip Unitt, San Diego Natural History Museum, P.O. Box 1390, San Diego, CA 92112. For matter of style consult the Suggestions to *Contributors to Western Birds* (8 pages available at no cost from the editor) and the *Council of Biology Editors Style Manual* (available for $24 from the Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, MD 20814).

Reprints can be ordered at author's expense from the Editor when proof is returned or earlier.

Good photographs of rare and unusual birds, unaccompanied by an article but with caption including species, date, locality and other pertinent information, are wanted for publication in Western Birds. Submit photos and captions to Photo Editor. Also needed are black and white pen and ink drawings of western birds. Please send these, with captions, to Graphics Manager.

WESTERN BIRDS

Volume 28, Number 2, 1997

INVENTORY OF THE SPECIES AND SUBSPECIES OF ALASKA BIRDS

DANIEL D. GIBSON and BRINA KESSEL, University of Alaska Museum, Fairbanks, Alaska 99775-6960

The most recent inventory of all of the modern avian taxa known from Alaska has been for many years that of Gabrielson and Lincoln (1959), who discussed 311 species and an additional 102 subspecies. Their data and many of their assessments were also reflected in the fifth edition of the AOU *Check-list of North American Birds* (1957), produced by a committee of which F. C. Lincoln was a member. In the 41 years that have elapsed since 1956, when their data collection ended, many additional species and subspecies have been recorded in Alaska, the validity and limits of numerous taxa have been re-evaluated, and new subspecies have been described. Some of these new subspecies have been described from Alaska (Feinstein 1958, Kemsies 1961, Webster 1983, Rea and Webster in Phillips 1986, Gibson and Kessel 1989, Phillips 1991, Dickerman and Gustafson 1996), from adjacent Canada (Browning 1994), or from northeastern Russia (Tomkovich 1986, 1990). Other subspecies that affect an assessment of species here have been described from distant localities (Phillips 1962, Burleigh 1963, Walkinshaw 1965, White 1968, Oberholser 1974, Delacour and Ripley 1975, Phillips 1981, Dickerman 1986, Jehl 1987a).

Our own ongoing efforts to verify the identifications and associated data of Alaska voucher specimens of particular historical or distributional significance led to this paper. Because Alaska is a vast, zoogeographically dynamic, and pivotally important interface between the Old World and New World avifaunas, we have compiled this inventory to provide an up-to-date regional review of the continuing process of learning and proving the distributions of wild birds—by collecting and careful subsequent museum studies (see Phillips 1986:xxxii). For avian systematists and other ornithologists who will be interested in verifying the bases for ornithological conclusions, we include the numbers and locations of Alaska specimens we deem significant, and we include the bibliographic links between historical perspective (AOU 1957, Gabrielson and Lincoln 1959) and contemporary recommendations for treatment as species and subspecies—including syn-

onymy at either of these taxonomic levels—for every lower avian taxon currently known from Alaska.

Thus, preserved specimens from Alaska constitute the foundation of this paper. Institutional abbreviations identify the ornithology collections cited in text: AMNH, American Museum of Natural History, New York City; ANSP, Academy of Natural Sciences of Philadelphia; BMNH, British Museum Natural History, Tring, Hertfordshire, Great Britain; CAS, California Academy of Sciences, San Francisco; CHAS, Chicago Academy of Sciences; CU, Cornell University, Ithaca, New York; DMNH, Denver Museum of Natural History; FMNH, Field Museum of Natural History, Chicago; LACM, Natural History Museum of Los Angeles County; MCZ, Museum of Comparative Zoology, Harvard University; MMNH, James F. Bell Museum of Natural History, University of Minnesota, St. Paul; MVZ, Museum of Vertebrate Zoology, University of California Berkeley; PSM, University of Puget Sound, Tacoma, Washington; ROM, Royal Ontario Museum, Toronto; SBCM, San Bernardino County Museum, Redlands, California; SCK, Southwestern College Natural History Museum, Winfield, Kansas; SDNHM, San Diego Natural History Museum; UAM, University of Alaska Museum, Fairbanks; UBC, University of British Columbia, Vancouver; UCLA, University of California Los Angeles; UMMZ, University of Michigan Museum of Zoology, Ann Arbor; USNM, United States National Museum, Washington, DC; UU, Utah Museum of Natural History, University of Utah, Salt Lake City; UWBM, University of Washington-Burke Museum, Seattle; ZIAS, Zoological Institute, Academy of Sciences, St. Petersburg, Russia.

Where italicized (e.g., *USNM 999999* or *USNM, 1*), specimen references denote that Gibson has examined these specimens himself. Many of the specimens examined have not been discussed or cited in the ornithological literature; the accompanying citations, therefore, often do not constitute references to every specimen listed and in some cases refer to no more than one of them. Subspecies that we believe to be valid on the basis of our own studies are identified by an asterisk (*); others we have not assessed independently. We do not attempt to discuss in detail all the re-evaluations of polytypic species since the fifth AOU Check-list (1957) and Gabrielson and Lincoln (1959); where our assessment differs from (either of) theirs, a published authority is cited or it is our own.

A discussion of status, distribution, and abundance is beyond the scope of this paper, but "one record" denotes the only Alaska record known to us; "one specimen," on the other hand, denotes that additional Alaska records exist that are not specimen-substantiated. Nomenclature and limits of avian families, phylogenetic sequence, and English names follow the most recent AOU *Check-list of North American Birds* (sixth ed., 1983, and supplements). Braces specify type localities. In the case of polytypic species, the English name for the species is given only after the first subspecies. Multiple subspecies are listed chronologically—except those of the Rock Ptarmigan, Winter Wren, and Fox and Song sparrows, which are arranged from west to east—and briefly characterized. Bracketed subspecies are inferences: they have not been substantiated by specimen in Alaska. The six biogeographic regions of Alaska (Figure 1: SE, SC, SW, C, W, and N Alaska—Kessel and Gibson 1978) are capitalized.

Twenty-five species are included for which no Alaska specimen evidence exists; one (Veery) has been substantiated by archived audio recording, the rest by *readily* identifiable archived or published photographs. We state where these substantiating materials are archived or published, but note that such photographs, while they serve to document the simple fact of occurrence, provide no biological material for study. Species attributed to Alaska on the basis of unsubstantiated sight (or sound) reports alone, including 12 published in the formal ornithological literature [*Puffinus creatopus*, Pink-footed Shearwater; *P. carneipes*, Flesh-footed Shearwater; *P. bulleri*, Buller's Shearwater; *P. puffinus* Manx Shearwater (all Kessel and Gibson 1978); *Egretta thula*, Snowy Egret (Nelson 1958); *Branta leucopsis*, Barnacle Goose (Palmer 1976a); *Catoptrophorus semipalmatus*, Willet (Van Velzen 1963); *Phalaenoptilus nuttallii*, Common Poorwill (Yocom 1963); *Stellula calliope*, Calliope Hummingbird (Willett 1921a); *Ficedula mugimaki*, Mugimaki Flycatcher (AOU 1987); *Icteria virens*, Yellow-breasted Chat; *Pheucticus ludovicianus*, Rose-breasted Grosbeak (both Yocom 1963)], are not discussed further. No avian species introduced by humans into Alaska has developed a self-sustaining, wild population (one, *Columba livia*, the Rock Dove, persists locally as a commensal of man).

Thus constituted, this 1996 inventory comprises 448 species and an additional 110 subspecies of birds known from Alaska.

GAVIIDAE

Gavia stellata (Pontoppidan, 1763) {Denmark}. Red-throated Loon.

*Gavia arctica viridigularis** Dwight, 1918 {Gizhiga, Sea of Okhotsk}. Arctic Loon. At least 13 specimens (*DMNH*, 5; CHAS, 4; *USNM*, 2; *MCZ*, 1; *UAM*, 1—see Preble and McAtee 1923, Bailey 1948).

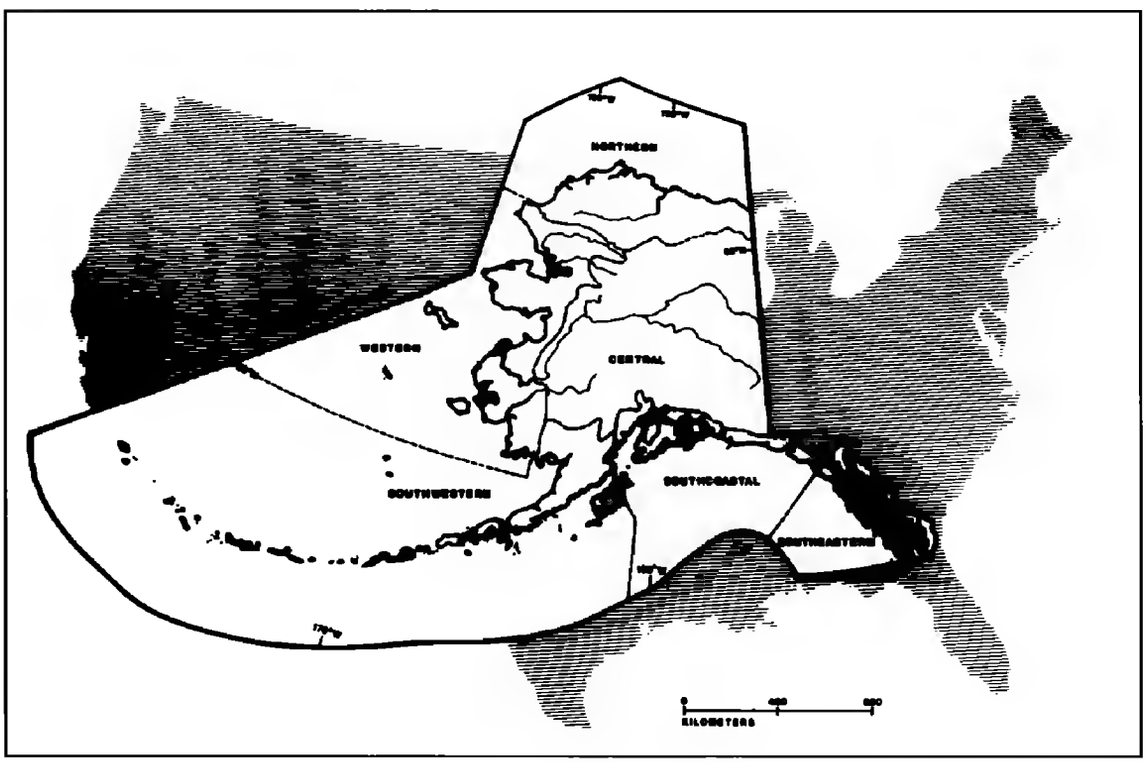

Figure 1. The six biogeographic regions of Alaska.

Gavia pacifica (Lawrence, 1858) {San Diego, California}. Pacific Loon. Maintained as a subspecies of *G. arctica* for many years (from AOU 1931); restored to full species rank by AOU (1985), following studies in Asia (see Kishchinski 1980). Specimens *DMNH 25415* (Bailey 1953) and *DMNH 26769* (Bailey 1956), published as examples of *G. a. viridigularis*, have been reidentified as *G. pacifica* (A. A. Kishchinski, A. R. Phillips—on specimen labels).

Gavia immer (Brünnich, 1764) {Faeroe Islands}. Common Loon.

Gavia adamsii (G. R. Gray, 1859) {Alaska}. Yellow-billed Loon.

PODICIPEDIDAE

Podilymbus podiceps [*podiceps* (Linnaeus, 1758) {South Carolina}]. Pied-billed Grebe. Multiple records (no specimen; UAM photos)—see Kessel and Gibson (1978).

Podiceps auritus cornutus (Gmelin, 1789) {Hudson Bay}. Horned Grebe.

Podiceps grisegena holboellii Reinhardt, 1853 {southern Greenland}. Red-necked Grebe.

Aechmophorus occidentalis occidentalis (Lawrence, 1858) {Fort Steilacoom, Washington}. Western Grebe. Dickerman (1986) described subspecies and relegated northern birds to this form. At least three specimens (*UAM, 2*; *LACM, 1*—see Willett 1923, Kessel and Gibson 1978).

DIOMEDEIDAE

Diomedea albatrus Pallas, 1769 {Bering Sea, off Kamchatka}. Short-tailed Albatross.

Diomedea nigripes Audubon, 1839 {Pacific Ocean at 30° 44′ N, 146° W}. Black-footed Albatross.

Diomedea immutabilis Rothschild, 1893 {Laysan Island, Hawaii}. Laysan Albatross.

PROCELLARIIDAE

Fulmarus glacialis rodgersii Cassin, 1862 {North Pacific Ocean}. Northern Fulmar. Includes *glupischa* Stejneger, 1884 {Commander Islands}, according to Hellmayr and Conover (1948a).

Pterodroma inexpectata (Forster, 1844) {Antarctic Ocean}. Mottled Petrel. Includes *fisheri* (Ridgway, 1883) {Kodiak Island, Alaska}, according to Hellmayr and Conover (1948a). At least five specimens (*USNM, 4*; UWBM, 1—see Murie 1959, Deignan 1961). We did not locate those reported by Bent (1912) or Willett (1914).

Pterodroma cookii (G. R. Gray, 1843) {New Zealand}. Cook's Petrel. Monotypic (Jouanin and Mougin, in Mayr and Cottrell 1979). One record (*FMNH 127885*): off Adak Island, Aleutians, early August 1933—Anthony (1934).

Puffinus griseus (Gmelin, 1789) {New Zealand}. Sooty Shearwater.

Puffinus tenuirostris (Temminck, 1835) {Japan}. Short-tailed Shearwater.

HYDROBATIDAE

*Oceanodroma furcata furcata** (Gmelin, 1789) {Bering Sea}. Fork-tailed Storm-Petrel. Larger and paler; includes *orientalis* (Pallas, 1811) {Kurile Islands and Unalaska}, according to Hellmayr and Conover (1948a). Breeds Aleutians.

*O. f. plumbea** (Peale, 1848) {off Cape Flattery, Washington}. Smaller and darker; breeds SE Alaska.

Oceanodroma leucorhoa leucorhoa (Vieillot, 1817) {France}. Leach's Storm-Petrel. Includes *beali* Emerson, 1906 {Sitka Bay, Alaska}, following Ainley (1980).

PELECANIDAE

Pelecanus erythrorhynchos Gmelin, 1789 {Hudson Bay}. American White Pelican. Multiple records (no specimen; photos UAM and Am. Birds 35:852, 1981; 47:1140, 1993)—see Gibson and Kessel (1992).

PHALACROCORACIDAE

Phalacrocorax auritus cincinatus (Brandt, 1837) {Kodiak Island, Alaska}. Double-crested Cormorant.

Phalacrocorax penicillatus (Brandt, 1837) {Vancouver Island, British Columbia}. Brandt's Cormorant. Two specimens (*UAM, 1*; *USNM, 1*—see Willett 1918).

Phalacrocorax pelagicus pelagicus Pallas, 1811 {Aleutian Islands, Alaska}. Pelagic Cormorant. Includes *robustus* Ridgway, 1884 {"coast of Alaska"}, according to Hellmayr and Conover (1948a:147). We include *P. kenyoni* (Siegel-Causey, 1991) {Amchitka Island, Aleutians} as a synonym; our skepticism that this taxon—a contemporary bird described from skeletal characters alone—is separable stems, in part, from our observation that "a number of the Red-faced Cormorant skeletons used in establishing a comparison for the diagnosis are from localities beyond the geographic range of *P. urile*" (Kessel and Gibson 1993:7). AOU (1993:680) relegated *P. kenyoni* to indeterminate status, "pending acquisition of additional specimen material."

Phalacrocorax urile (Gmelin, 1789) {Kamchatka}. Red-faced Cormorant. Includes *bicristatus* Pallas, 1811 {Kamchatka}, according to Hellmayr and Conover (1948a).

FREGATIDAE

Fregata magnificens Mathews, 1914 {Galápagos Islands}. Magnificent Frigatebird. Monotypic (Palmer 1962). One record (no specimen; UAM photos): Belkofski Bay, Alaska Peninsula, 15 August 1985—Gibson and Kessel (1992).

ARDEIDAE

Botaurus lentiginosus (Rackett, 1813) {England}. American Bittern. Two *UAM* specimens (Kessel and Gibson 1978); we did not locate two discussed by Willett (1921a).

Ixobrychus sinensis (Gmelin, 1789) {China}. Yellow Bittern. One record (*UAM 5611*): Attu Island, Aleutians, 17-22 May 1989—Gibson and Kessel (1992).

*Ardea herodias fannini** Chapman, 1901 {Graham Island, Queen Charlotte Islands, British Columbia}. Great Blue Heron.

Ardea alba [*egretta* Gmelin, 1789 {Cayenne} and *modesta* J. E. Gray, 1831 {India}]. Great Egret. Multiple records (no specimen; UAM photos)—see Gibson and Kessel (1992). Occurrences in SE and SC Alaska have different timing from those in SW Alaska, pointing to the likelihood that this heron (like *Bubulcus ibis* and *Nycticorax nycticorax*) has reached Alaska from both New World and Old World populations.

Egretta eulophotes (Swinhoe, 1860) {Amoy, China}. Chinese Egret. One record (*UAM 2805*): Agattu Island, Aleutians, 16 June 1974—Byrd et al. (1978).

Ardeola bacchus (Bonaparte, 1855) {Malay Peninsula}. Chinese Pond Heron. One record (no specimen; UAM photos): St. Paul Island, Pribilof Islands, 4–9 August 1996, S. D. Smith and others.

*Bubulcus ibis ibis** (Linnaeus, 1758) {Egypt}. Cattle Egret. Smaller; a late-fall visitant to SE Alaska. Three *UAM* specimens (see Gibson and Kessel 1992).

*B. i. coromanda** (Boddaert, 1783) {Coromandel coast of India}. Larger; in nuptial plumage has cinnamon-colored ornamental feathering over entire head (including cheek, chin, and throat) and on foreneck, breast and back; southern and eastern Asia. One record (*UAM 5553*): Agattu Island, Aleutians, found dead 19 June 1988—Gibson and Kessel (1992).

Butorides virescens [*anthonyi* (Mearns, 1895) {Salton River, Baja California Norte}]. Green Heron. One record (no specimen; UAM photos): Juneau, 29 May 1983—Gibson and Kessel (1992).

Nycticorax nycticorax [*nycticorax* (Linnaeus, 1758) {southern Europe} and *hoactli* (Gmelin, 1789) {Valley of Mexico}]. Black-crowned Night-Heron. Multiple records (no specimen; UAM photos)—see Gibson and Kessel (1992). Occurrences in the

Aleutian Islands have different timing from the one occurrence in SE Alaska, pointing to the likelihood that this heron (like *Ardea alba* and *Bubulcus ibis*) has reached Alaska from both Old World and New World populations (whether or not the New World birds are regarded as nomenclaturally distinct—Payne [in Mayr and Cottrell 1979] submerged *hoactli* in nominate *nycticorax*).

ANATIDAE

*Cygnus columbianus columbianus** (Ord, 1815) {below the great narrows of the Columbia River}. Tundra Swan. Adult has yellow spot at base of black bill; throughout Alaska range of the species.

*C. c. bewickii** Yarrell, 1830 {England}. Adult has entire base of bill yellow; northern Palearctic. Includes *jankowskyi* Alphéraky, 1904 {Vladivostok}, following Cramp and Simmons (1977). One record (*UAM 3840*): Adak Island, Aleutians, found dead December 1977—Evans and Sladen (1980).

Cygnus cygnus (Linnaeus, 1758) {Sweden}. Whooper Swan. At least seven specimens (*USNM, 5*; SBCM, 1; *UAM, 1*—see Wilke 1944, Kenyon 1961, Byrd et al. 1974).

Cygnus buccinator Richardson, 1831 {Hudson Bay}. Trumpeter Swan.

*Anser fabalis serrirostris** Swinhoe, 1871 {near Amoy, China}. Bean Goose. Smaller, with shorter, high-based bill; tundras of northeasternmost Asia. Four specimens (*USNM, 2*; *DMNH, 1*; *UAM, 1*—Fay and Cade 1959, Sladen 1966, Byrd et al. 1978).

*A. f. middendorffii** Severtzov, 1872 {eastern Siberia}. Larger, with longer, shallower bill; Siberia, west and south of *serrirostris*; includes *sibiricus* (Alphéraky, 1904) {east Siberia}, according to Vaurie (1965). One record (*USNM 588116*): St. Paul Island, Pribilofs, 19 April 1946—Gabrielson and Lincoln 1959).

*Anser albifrons gambelli** Hartlaub, 1852 {Texas}. Greater White-fronted Goose. Large and pale; breeds N Alaska and western Canada (Palmer 1976a).

*A. a. frontalis** Baird, 1858 {Fort Thorn, New Mexico}. Small and pale; the breeding form in eastern Asia, W and SW Alaska (see Palmer 1976a).

*A. a. elgasi** Delacour and Ripley, 1975 {Sacramento National Wildlife Refuge, California}. Large and dark; breeds western Cook Inlet (and in southern C and elsewhere in SC Alaska?). See AOU (1985).

Anser erythropus (Linnaeus, 1758) {northern Sweden}. Lesser White-fronted Goose. One record (*UAM 6518*): Attu Island, Aleutians, 5 June 1994, D. D. Gibson.

Chen caerulescens caerulescens (Linnaeus, 1758) {Hudson Bay}. Snow Goose. With the recognition that the "Blue Goose" is a color morph of the Snow Goose and not taxonomically distinct (AOU 1973), the name *hyperborea* (Pallas, 1769) {northeastern Siberia} became a synonym.

Chen rossii (Cassin, 1861) {Great Slave Lake, Northwest Territories}. Ross' Goose. Multiple records (no specimen; UAM photos). We did not find the specimen reported by Willett (1921a).

Chen canagica (Sevastianov, 1802) {Kanaga Island, Aleutians}. Emperor Goose.

Branta bernicla nigricans (Lawrence, 1846) {Egg Harbor, New Jersey}. Brant. Formerly maintained as a full species, the Black Brant; relegated to subspecies status by AOU (1976). Alaska reports of light-bellied *B. b. hrota* (O. F. Müller, 1776) {Iceland} may be of intergrades (Gabrielson and Lincoln 1959).

*Branta canadensis leucopareia** (Brandt, 1836) {Aleutian Islands, Alaska}. Canada Goose. Small and moderately dark (paler than *minima*); usually has white collar; breeds locally in Aleutians, and in Semidi Islands. See Shields and Wilson (1987).

*B. c. parvipes** (Cassin, 1852) {Veracruz}. Medium sized; color of underparts variable, but the palest subspecies in Alaska; breeds C and N Alaska. Includes *taverneri* Delacour, 1951 {Colusa, California}, following Palmer (1976a).

*B. c. occidentalis** (Baird, 1858) {Port Townsend, Washington}. Fairly large; dark; breeds northern Gulf of Alaska coast.

*B. c. minima** Ridgway, 1885 {St. Michael, Alaska}. Smallest; rather dark; breeds coastal W Alaska.

*B. c. fulva** Delacour, 1951 {Graham Island, Queen Charlotte Islands, British Columbia}. Distinctly larger than *occidentalis*; lighter, more fulvous; no collar; bill longer and flatter. Largely resident SE Alaska.

Aix sponsa (Linnaeus, 1758) {South Carolina}. Wood Duck. One specimen (*UAM 6585*): Kodiak Island, 9 November 1994, D. Sitton.

*Anas crecca crecca** Linnaeus, 1758 {Sweden}. Green-winged Teal. Male in definitive alternate plumage has white scapular stripe, narrow white border to green face patch; breeds Aleutians. We include *nimia* Friedmann, 1948 {Kiska Island, Aleutians} as a synonym.

*A. c. carolinensis** Gmelin, 1789 {South Carolina}. Male has white breast bar, no white scapular stripe or white edge to face patch; widespread breeder in Alaska, except Aleutians.

Anas formosa Georgi, 1775 {Lake Baikal, Siberia}. Baikal Teal. At least 13 specimens (*USNM, 6*; *DMNH, 4*; CHAS, 2; *CAS, 1*—see Bailey 1924, 1933, 1948; Gabrielson 1941; Sladen 1966). Immature male *CAS 20728*, originally identified (Hanna 1920b) as *A. c. crecca*, has been reidentified as this species (J. D. Webster in litt., 1987).

Anas falcata Georgi, 1775 {Baikal region, Siberia}. Falcated Teal. Three specimens (SBCM, 1; *UAM, 1*; *USNM, 1*—Hanna 1920a, Byrd et al. 1974).

Anas rubripes Brewster, 1902 {Lake Umbagog, New Hampshire}. American Black Duck. Multiple records (no specimen; UAM photos)—Kessel and Gibson (1978).

Anas platyrhynchos platyrhynchos Linnaeus, 1758 {Sweden}. Mallard. Includes *neoboria* Oberholser, 1974 {Athabaska River, Alberta}, following Browning (1974).

*Anas poecilorhyncha zonorhyncha** Swinhoe, 1866 {Ningpo, China}. Spot-billed Duck. One specimen (*UAM 3631*): Kodiak Island, 30 October–1 November 1977—Trapp and MacIntosh (1978).

Anas acuta Linnaeus, 1758 {Sweden}. Northern Pintail.

Anas querquedula Linnaeus, 1758 {Sweden}. Garganey. Four *UAM* specimens (Byrd et al. 1978, Gibson 1981).

Anas discors Linnaeus, 1766 {South Carolina}. Blue-winged Teal. Monotypic (Palmer 1976a). At least 12 specimens (*UAM, 10*; USNM, 2—see Kessel 1955, Hansen 1960, Byrd et al. 1974 [specimen "AIR 101" = *UAM 6108*]).

*Anas cyanoptera septentrionalium** Snyder and Lumsden, 1951 {south of Jensen, Utah}. Cinnamon Teal. One specimen (*UAM 3582*): Sergief Island, Stikine River mouth, 20 May 1977—Kessel and Gibson (1978).

Anas clypeata Linnaeus, 1758 {Sweden}. Northern Shoveler.

Anas strepera strepera Linnaeus, 1758 {Sweden}. Gadwall. Polytypic, following Vaurie (1965) and Johnsgard (in Mayr and Cottrell 1979).

Anas penelope Linnaeus, 1758 {Sweden}. Eurasian Wigeon.

Anas americana Gmelin, 1789 {New York}. American Wigeon.

Aythya ferina (Linnaeus, 1758) {Sweden}. Common Pochard. Nine 20th-century specimens (*UAM, 5; USNM, 3*; SCK, 1—see Evermann 1913, Gibson 1981, Byrd and Day 1986). A 19th-century specimen (ZIAS 40329) from the Pribilofs (Gabrielson and Lincoln 1959) was "not in collection in last inventory" (fide E. C. Murphy, Univ. Alaska Fairbanks, in litt., 1988).

Aythya valisineria (Wilson, 1814) {United States}. Canvasback. See note under *Aythya americana*.

Aythya americana (Eyton, 1838) {North America}. Redhead. At least nine specimens (*UAM, 6*; *USNM, 3*—see Hansen 1960). A 19th-century specimen reported by E. N. Pavlovski to I. N. Gabrielson in 1950 (Gabrielson and Lincoln 1959) is instead a male *A. valisineria* in definitive alternate plumage (*ZIAS 55593*), taken in 1844 at St. Paul Island, Pribilofs, by I. G. Voznesenskii.

Aythya collaris (Donovan, 1809) {England}. Ring-necked Duck. There is a 19th-

century specimen (*ZIAS 39716*), taken 11 May 1842 at Sitka by I. G. Voznesenskii, and there are at least five 20th century specimens (*UAM, 5*—see Kessel 1955, Hansen 1960).

Aythya fuligula (Linnaeus, 1758) {Sweden}. Tufted Duck. At least 13 specimens (*UAM, 5*; *USNM, 4*; SCK, 2; *MVZ, 1*; SBCM, 1—see Evermann 1913, Sladen 1966, Byrd et al. 1974, Gibson 1981).

*Aythya marila marila** (Linnaeus, 1761) {Lapland}. Greater Scaup. Male whiter-backed in definitive alternate plumage; Old World. One record (*USNM 496822*): St. George Island, Pribilofs, 29 June 1966—Banks (1986b).

*A. m. nearctica** Stejneger, 1885 {North America}. Male with coarser and more extensive black vermiculation on mantle. The New World subspecies, widespread in Alaska.

Aythya affinis (Eyton, 1838) {North America}. Lesser Scaup.

*Somateria mollissima borealis** (C. L. Brehm, 1824) {Greenland}. Common Eider. Male in definitive alternate plumage has greenish bill, bill processes rounded (not sharply pointed), no black V on throat; Greenland and eastern Canadian arctic archipelago. One record (*UAM 6631*): Point Barrow, found dead 7 August 1994, M. Johnson.

*S. m. v-nigra** Bonaparte, 1855 {Kotzebue Sound, Alaska}. Male has orange bill, sharply pointed bill processes, black throat V; throughout the Alaska range of the species.

Somateria spectabilis (Linnaeus, 1758) {Sweden}. King Eider. Includes *beringii* (Gmelin, 1789) {Bering Island, Commander Islands}, according to Hellmayr and Conover (1948a).

Somateria fischeri (Brandt, 1847) {St. Michael, Alaska}. Spectacled Eider.

Polysticta stelleri (Pallas, 1769) {Kamchatka}. Steller's Eider.

Histrionicus histrionicus (Linnaeus, 1758) {Newfoundland}. Harlequin Duck. Monotypic; includes *pacificus* W. S. Brooks, 1915 {Cape Shipunski, Kamchatka}.

Clangula hyemalis (Linnaeus, 1758) {northern Sweden}. Oldsquaw.

*Melanitta nigra americana** (Swainson, 1832) {Hudson Bay at 57°N}. Black Scoter. Possibly specifically distinct from *M. nigra* (Linnaeus, 1758) {Lapland and England}, according to AOU (1987).

Melanitta perspicillata (Linnaeus, 1758) {Hudson Bay}. Surf Scoter.

*Melanitta fusca deglandi** (Bonaparte, 1850) {America}. White-winged Scoter. Includes former species *M. deglandi* and subspecies *dixoni* (W. S. Brooks, 1915) {"Humphrey Point [= Griffin Point], arctic Alaska" (AOU 1957:93)}, following Palmer (1976b).

Bucephala clangula clangula (Linnaeus, 1758) {Sweden}. Common Goldeneye. Smaller; Old World. One record (*USNM 237500*): St. Paul Island, Pribilofs, 27 November 1914—Hanna (1916).

B. c. americana (Bonaparte, 1838) {eastern United States}. Larger; New World; widespread in Alaska.

Bucephala islandica (Gmelin, 1789) {Iceland}. Barrow's Goldeneye.

Bucephala albeola (Linnaeus, 1758) {Newfoundland}. Bufflehead.

Mergellus albellus (Linnaeus, 1758) {Mediterranean, near Smyrna}. Smew. Five specimens (*USNM, 3*; *UAM, 2*—see Sladen 1966, Byrd et al. 1974).

Lophodytes cucullatus (Linnaeus, 1758) {South Carolina}. Hooded Merganser.

*Mergus merganser merganser** Linnaeus, 1758 {Sweden}. Common Merganser. Male in definitive alternate plumage has black bar on greater upper wing-coverts concealed by white median coverts; migrant from Asia in western Aleutians, whence two *UAM* specimens (Byrd et al. 1978, Gibson 1981).

*M. m. americanus** Cassin, 1852 {North America}. Male has black bar on greater upper wing-coverts exposed, not concealed by white median coverts. The North American subspecies; widespread in southern Alaska, reaches C and W Alaska.

Mergus serrator Linnaeus, 1758 {Sweden}. Red-breasted Merganser. Monotypic (Vaurie 1965, Palmer 1976b, Cramp and Simmons 1977).

Oxyura jamaicensis rubida (Wilson, 1814) {Delaware River, near Philadelphia}. Ruddy Duck. At least three specimens (*USNM, 2*; *UAM, 1*—Hansen 1960, Kessel and Springer 1966).

CATHARTIDAE

Cathartes aura meridionalis Swann, 1921 {Colombia}. Turkey Vulture. Includes *teter* Friedmann, 1933 {Riverside, California}, following Wetmore (1964). One specimen (*UAM 7000*): Fort Davis, Nome River mouth, found dead 24 October 1996, C. Lean.

ACCIPITRIDAE

Pandion haliaetus carolinensis (Gmelin, 1788) {South Carolina}. Osprey.

Haliaeetus leucocephalus alascanus C. H. Townsend, 1897 {Unalaska Island, Aleutians}. Bald Eagle. Palmer (1988a) recommended treating this species as monotypic.

Haliaeetus albicilla (Linnaeus, 1758) {Sweden}. White-tailed Eagle. Monotypic (AOU 1957, Cramp and Simmons 1980). Only specimen evidence is an adult's central rectrix (*UAM 6015*, Attu Island, Aleutians, found June 1992, R. L. Scher and T. L. Savaloja). Photos UAM (of breeding pair, feeding young, at only known Alaska aerie—see Tobish and Balch 1987) and Birding 14 (3-4): cover, 1982; Am. Birds 36:885, 1982; 46:1166, 1992. Reported to be the first western North American record of this species (Bishop 1900) and years later "without question the typical race" (Hellmayr and Conover 1949:217), a juvenile female *Haliaeetus* (*FMNH 130665*) found dead at Unalaska Island, Aleutians, on 5 October 1899 has been reidentified as a Bald Eagle (Gibson, 1990). In the absence of voucher specimens, "two stomachs" from SE Alaska (Cottam and Knappen 1939:151) cannot be given credence, and we suspect that "osseous remains" from Kodiak middens (Friedmann 1935:29) were attributed to this species in error.

Haliaeetus pelagicus (Pallas, 1811) {Bering Island, Commander Islands}. Steller's Sea-Eagle. Multiple records (no specimen; photos UAM and Gilbert 1922). Reported to be the first North American specimen of this species (Hanna 1920a), an immature *Haliaeetus* (*USNM 226265*—the skeleton less one wing and leg, plus *USNM 255158*—one foot and feathered tarsus, one feathered wing) collected at St. Paul Island, Pribilofs, on 15 December 1917 has been reidentified as a Bald Eagle (S. L. Olson in litt., 1996). An adult Steller's Sea-Eagle shot at Kodiak Island in 1921 (Gilbert 1922, including published photo), on the other hand, was not preserved. If extant, "several bones" attributed to this species from Kodiak middens (Friedmann 1935:30) should be re-examined.

*Circus cyaneus hudsonius** (Linnaeus, 1766) {Hudson Bay}. Northern Harrier.

*Accipiter striatus velox** (Wilson, 1812) {Philadelphia, Pennsylvania}. Sharp-shinned Hawk. Paler; most of Alaska range of the species.

*A. s. perobscurus** Snyder, 1938 {Graham Island, Queen Charlotte Islands, British Columbia}. Darker; difference most pronounced in immature plumage; SE Alaska.

*Accipiter gentilis atricapillus** (Wilson, 1812) {near Philadelphia, Pennsylvania}. Northern Goshawk. Paler; most of Alaska range of the species.

*A. g. laingi** (Taverner, 1940) {Graham Island, Queen Charlotte Islands, British Columbia}. Darker; SE Alaska.

Buteo swainsoni Bonaparte, 1838 {Fort Vancouver, Washington}. Swainson's Hawk. Seven specimens (*UAM, 3*; *USNM, 3*; *MVZ, 1*—see Dall and Bannister 1869, Dice 1920, Gabrielson and Lincoln 1959).

*Buteo jamaicensis harlani** (Audubon, 1831) {St. Francisville, Louisiana}. Red-tailed Hawk. "Typical" adult exhibits extreme melanism and an unbarred whitish mottled tail (Mindell 1985). Formerly treated as a full species by both AOU (1957) and Gabrielson and Lincoln (1959); considered a subspecies of *B. jamaicensis* (Gmelin, 1788) {Jamaica} by AOU (1973). We follow Mindell (1983) in recognizing *harlani*

as the widespread breeding subspecies of western C Alaska; intergrades with *calurus* (q. v.) numerous in eastern C Alaska (ibid.). Palmer (1988b) discussed "Harlan's Hawk" as a color morph of next subspecies.

*B. j. calurus** Cassin, 1855 {Fort Webster, Rio Mimbres, New Mexico}. Large; adult's tail red; light-morph adult's back paler. Intergrades with *harlani* numerous in eastern C Alaska. We agree with Mindell (1983) that most Alaska reports referred to this subspecies may be of intergrades.

*B. j. alascensis** Grinnell, 1909 {Glacier Bay, Alaska}. Small; resembles *calurus*, but dark areas blacker and more extended; SE Alaska. One other subspecies has been reported from Alaska: *kriderii* Hoopes, 1873 {Winnebago County, Iowa}. It is regarded as a color variant within *calurus*, however, rather than a subspecies, by Palmer (1988b) and R. W. Dickerman (in litt., 1996). The only Alaska specimen of this phenotype (Coe College [Iowa] 769 [formerly 336], Eagle, "winter 1903," Bailey 1916) is "not among the birds currently in the collection" (H. H. Hadow in litt., 1996).

Buteo lagopus sanctijohannis (Gmelin, 1788) {Newfoundland}. Rough-legged Hawk. Breeds throughout the North American range of the species, according to Palmer (1988b). AOU (1957) and Gabrielson and Lincoln (1959) included *kamtschatkensis* Dementiev, 1931 {Kikhchik River, Kamchatka}, which is larger and paler than *sanctijohannis* and entirely without a dark morph, as the breeding bird of coastal W and N Alaska. Cade (1955) identified all Alaska-breeding birds as intergrades between *sanctijohannis* and *kamtschatkensis*. Visitants in the western Aleutians (Gibson 1981, Byrd and Day 1986), whence there are no specimens, are probably direct migrants from Asia.

Aquila chrysaetos canadensis (Linnaeus, 1758) {Hudson Bay}. Golden Eagle.

FALCONIDAE

Falco tinnunculus interstinctus Horsfield, 1840 {Assam, India}. Eurasian Kestrel. One specimen (*UAM 3683*): Shemya Island, Aleutians, 5–9 September 1978—Gibson (1981).

Falco sparverius sparverius Linnaeus, 1758 {South Carolina}. American Kestrel.

*Falco columbarius columbarius** Linnaeus, 1758 {South Carolina}. Merlin. Gray dorsally, not marked ventrally with the contrast of *suckleyi*. Includes *bendirei* Swann, 1922 {Fort Walla Walla, Washington}, following Palmer (1988b). The widespread breeding subspecies, found throughout most of the Alaska range of the species.

*F. c. suckleyi** Ridgway, 1874 {Shoalwater Bay, Washington}. Blackish dorsally, with very dark streaking ventrally; breeds southern SE Alaska.

Falco subbuteo [*subbuteo* Linnaeus, 1758 {Sweden}]. Eurasian Hobby. Only specimen evidence is a tail plus one primary remex (*UAM 5647*): Attu Island, Aleutians, found May 1987—Gibson and Kessel (1992). Photos UAM and Am. Birds 37:1018, 1983; Birding 16 (1): cover, 1984.

*Falco peregrinus anatum** Bonaparte, 1838 {Egg Harbor, New Jersey}. Peregrine Falcon. Large, richly colored and darkish (Palmer 1988b); intergrades with *tundrius*; C Alaska.

*F. p. pealei** Ridgway, 1874 {Oregon}. Largest, and very dark; Alaska Pacific coast, Aleutians to Dixon Entrance.

F. p. tundrius White, 1968 {Adelaide Peninsula, Northwest Territories}. Smaller than *anatum*; the palest North American subspecies; N Alaska. Two other subspecies have been reported from Alaska. A specimen (SBCM 6483) from Cape Prince of Wales, originally reported (Hanna 1940) as *calidus* Latham, 1790 {India} and subsequently listed as *harterti* Buturlin, 1907 {lower Kolyma River} by AOU (1957) and Gabrielson and Lincoln (1959), was regarded as "identical to average specimens of *tundrius*" from many localities and "provisionally referred to *tundrius*" by White (1968:185).

Falco rusticolus Linnaeus, 1758 {Sweden}. Gyrfalcon. Monotypic; "slight regional size differences do not warrant nomenclatural recognition" (Palmer 1988b).

PHASIANIDAE

*Falcipennis canadensis canadensis** (Linnaeus, 1758) {Hudson Bay}. Spruce Grouse. Male grayer; tail with chestnut terminal band; uppertail coverts not fringed white; we include *osgoodi* (Bishop, 1900) {Lake Marsh, Yukon Territory} and *atratus* (Grinnell, 1910) {Hawkins Island, Prince William Sound, Alaska}; throughout the Alaska taiga. We follow Dickerman and Gustafson (1996) in discussing this species in *Falcipennis* Elliot, 1864.

*F. c. isleibi** Dickerman and Gustafson, 1996 {Prince of Wales Island, Alexander Archipelago, Alaska}. Male blacker; tail without terminal band; uppertail coverts tipped narrowly with white. Comprises Alaska birds previously referred to *franklinii* (Douglas, 1829) {Okanagan, British Columbia}; Prince of Wales Island and satellites, Zarembo Island. At least 16 specimens (*UAM*, 6; AMNH, 5; LACM, 3; USNM, 2).

*Dendragapus obscurus sitkensis** Swarth, 1921 {Kupreanof Island, Alexander Archipelago, Alaska}. Blue Grouse. Includes *munroi* Griscom, 1923 {Queen Charlotte Islands, British Columbia}, according to Ridgway and Friedmann (1946). AOU (1957:125) erroneously attributed *richardsonii* (Douglas, 1829) {Jasper House, Alberta} to "the Stikine region of Alaska," apparently on the basis of Ridgway and Friedmann's (1946:85) incorrect inference that Swarth (1922:203–204) was referring to Alaska when he stated that synonym *flemingi* Taverner, 1914 {near Teslin Lake, Yukon Territory} occurred "in the mountains above Doch-da-on Creek" [= Dokdaon Creek] and "on Kirk's Mountain" [= Mt. Kirk]. Those Stikine River localities are both well within British Columbia; neither *richardsonii* nor *flemingi* is known from Alaska.

*Lagopus lagopus albus** (Gmelin, 1789) {Hudson Bay}. Willow Ptarmigan. Smaller than *alascensis*, with shorter wing and tail and narrower bill; winters in eastern C Alaska (West et al. 1970).

*L. l. alexandrae** Grinnell, 1909 {Baranof Island, Alexander Archipelago, Alaska}. Large like *alascensis*, but autumn coloration darker, especially dorsally, and bill slightly smaller and relatively much narrower; we do not believe that *muriei* Gabrielson and Lincoln, 1949 {Nagai Island, Shumagin Islands, Alaska} is separable. Coastal southern Alaska from easternmost of the Aleutian Islands (Unimak), the Shumagin Islands, and Alaska Peninsula east, including Kodiak archipelago, to southernmost SE Alaska (Prince of Wales Island). Intergrades with *alascensis* north of the base of the Alaska Peninsula, and with *albus* in northwestern British Columbia (AOU 1957). The assertion that the Willow Ptarmigan occurs in the Aleutians west of easternmost Unimak (Gabrielson and Lincoln 1949, AOU 1957, Gabrielson and Lincoln 1959, Murie 1959, AOU 1983) is based on specimens (*CAS*, 6) taken putatively at Atka and Unalaska islands from 27 May to 25 June 1915, by J. Aug. Kusche. Others (*UCLA*, 5) have come to light that were taken, according to their labels, at Unalaska on 20 April 1914, by Fred L. Granville. Besides these specimens, there is no evidence whatever that this conspicuous, nonmigratory species has ever occurred in the Aleutians beyond Unimak. The Atka birds (*CAS*, 2) are labeled erroneously, and we remain skeptical of the origin of the Unalaska specimens. Recent reports of Willow Ptarmigan beyond Unimak—Christmas Bird Counts at Unalaska (Am. Birds 47:567, 1993, and Natl. Audubon Soc. Field Notes 48:443, 1994)—were subsequently recognized to have been misidentifications of winter-female Rock Ptarmigan (compiler Michael Ward in litt., 1996). Except for Dall (1873, 1874), whose sweeping misidentification of the Rock Ptarmigan was swiftly corrected by Nelson (1878), so far as we have been able to determine, no other investigator who has made published reference to ptarmigan in the Aleutians has ever reported finding *L. lagopus* beyond Unimak. See Bean (1882), Turner (1885, 1886), Nelson (1887), Bishop (1900), McGregor

(1906), Clark (1910), Bent (1912), Hersey (1916), Laing (1925), Eyerdam (1936), Sutton and Wilson (1946), Cahn (1947), Wilson (1948), Gabrielson and Lincoln (1949, 1959), Krog (1953), Murie (1959), Kenyon (1961), Emison et al. (1971), Byrd et al. (1974), White et al. (1977)—a list notably including I. N. Gabrielson and O. J. Murie, neither of whom ever found this conspicuous species himself in extensive Aleutian fieldwork beyond Unimak.

*L. l. alascensis** Swarth, 1926 {Kobuk River Delta, Alaska}. Large like *alexandrae*, but buffier in autumn and with slightly broader bill; the widespread race, throughout most of mainland Alaska.

*Lagopus mutus evermanni** Elliot, 1896 {Attu Island, Aleutians}. Rock Ptarmigan. Summer male is blackish, especially ventrally; usually invaded somewhat by brown dorsally; Attu Island.

*L. m. townsendi** Elliot, 1896 {Kiska Island, Aleutians}. Summer male is reddish to orangeish, with broader, coarser dark vermiculations than in *atkhensis*; we include *gabrielsoni* Murie, 1944 {Amchitka Island, Aleutians}; west-central Aleutians: Rat Islands (Kiska to Amchitka).

*L. m. atkhensis** Turner, 1882 {Atka Island, Aleutians}. Summer male is rufous, dark to pale, with fine black/brown vermiculations; we include *sanfordi* Bent, 1912 {Tanaga Island, Aleutians} and *chamberlaini* Clark, 1907 {Adak Island, Aleutians}; central Aleutians: Andreanof Islands (Tanaga to Atka, possibly Amlia).

*L. m. nelsoni** Stejneger, 1884 {Unalaska Island, Aleutians}. Summer male is dark brown with fine blackish vermiculations. Includes *yunaskensis* Gabrielson and Lincoln, 1951 {Yunaska Island, Aleutians} and *kelloggae* Grinnell, 1910 {Montague Island, Prince William Sound, Alaska}; northeastern Asia, N and C Alaska south to SW and SC Alaska (to Islands of Four Mountains in eastern Aleutians, Shumagin Islands, Alaska Peninsula, and Kodiak archipelago) and east apparently to northernmost SE Alaska.

*L. m. dixoni** Grinnell, 1909 {Chichagof Island, Alexander Archipelago, Alaska}. Summer male is dark brown but grayer than *nelsoni*, with fine vermiculations; SE Alaska (Coast Mountains and Chichagof, Baranof, and Admiralty islands).

Lagopus leucurus peninsularis Chapman, 1902 {Kenai Mountains, Alaska}. White-tailed Ptarmigan.

*Bonasa umbellus umbelloides** (Douglas, 1829) {Henry House, Alberta}. Ruffed Grouse. Darker dorsally and ventrally, tarsi incompletely feathered; SE Alaska at Hyder and on Stikine and Taku rivers.

*B. u. yukonensis** Grinnell, 1916 {Fortymile, Yukon River, Yukon Territory}. Grayer and paler, tarsi feathered to toes; C Alaska.

*Tympanuchus phasianellus caurus** (Friedmann, 1943) {Fairbanks, Alaska}. Sharp-tailed Grouse.

RALLIDAE

Rallus limicola [*limicola* Vieillot, 1819 {Pennsylvania}]. Virginia Rail. The only specimen is a skeleton (*UAM 5292*): Prince of Wales Island, Alexander Archipelago, found dead 17 February 1986—Gibson and Kessel (1992).

Porzana carolina (Linnaeus, 1758) {Hudson Bay}. Sora. At least eight specimens (*UAM, 7*; *USNM, 1*—Nelson 1958, Kessel and Springer 1966, Kessel and Gibson 1978).

Fulica atra atra Linnaeus, 1758 {Sweden}. Eurasian Coot. One record (*USNM 479548*): St. Paul Island, Pribilofs, 5 November 1962—Sladen (1966).

Fulica americana americana Gmelin, 1789 {North America}. American Coot. At least six specimens (*UAM, 3*; *LACM, 2*; *USNM, 1*—see Willett 1923, Murie 1959). We did not locate others cited by Willett (1914, 1921a).

GRUIDAE

*Grus canadensis canadensis** (Linnaeus, 1758) {Hudson Bay}. Sandhill Crane.

Breeds throughout the Alaska range of the species—except in the southern Alexander Archipelago, where a small breeding population is probably either *tabida* (Peters, 1925) {Humboldt River, Nevada}, which breeds in the adjacent Queen Charlotte Islands, British Columbia (AOU 1957), or *rowani* Walkinshaw, 1965 {near Fawcett, Alberta}. There are no specimens from this population.

Grus grus [*lilfordi* Sharpe, 1894 {"no type or type locality designated, but specimens listed from Siberia (Ob River), India, Nepal, and China (Swatow)" (Peters 1934:151)}]. Common Crane. One record (no specimen): Fairbanks, 24 April–10 May 1958—Kessel and Kelly (1958), including published photo.

CHARADRIIDAE

Pluvialis squatarola (Linnaeus, 1758) {Sweden}. Black-bellied Plover.

Pluvialis dominica (P. L. S. Müller, 1776) {Hispaniola}. American Golden-Plover.

Pluvialis fulva (Gmelin, 1789) {Tahiti}. Pacific Golden-Plover. Formerly maintained as a subspecies of *P. dominica*; elevated to full species rank by AOU (1993), following studies in Alaska (Connors 1983, Connors et al. 1993).

Charadrius mongolus stegmanni Stresemann, 1940 {Bering Island, Commander Islands}. Mongolian Plover. At least 18 specimens (*UAM, 6*; *USNM, 6*; *CAS, 2*; Univ. Museum at Oxford [Great Britain], 2; *DMNH, 1*; SBCM, 1—see Harting 1871; Swarth 1928; Friedmann 1934b, 1936; Bailey 1948; Kenyon and Phillips 1965; Thompson and DeLong 1969; Byrd et al. 1978; Kessel and Gibson 1978; Gibson 1981).

Charadrius alexandrinus [*nivosus* (Cassin, 1858) {San Francisco, California}]. Snowy Plover. One record (no specimen; UAM photos): Nome River mouth, 23-24 May 1991—Gibson and Kessel (1992).

Charadrius hiaticula tundrae (Lowe, 1915) {Yenisei Valley}. Common Ringed Plover. Five specimens (*UAM, 3*; *USNM, 2*—see Sealy et al. 1971, Byrd et al. 1978).

Charadrius semipalmatus Bonaparte, 1825 {coast of New Jersey}. Semipalmated Plover.

Charadrius dubius curonicus Gmelin, 1789 {Curonia, i.e., Latvia}. Little Ringed Plover. One specimen (*UAM 2717*): Buldir Island, Aleutians, 15–16 May 1974—Byrd et al. (1978).

Charadrius vociferus vociferus Linnaeus, 1758 {South Carolina}. Killdeer.

Charadrius morinellus Linnaeus, 1758 {Sweden}. Eurasian Dotterel. At least 14 specimens (*UAM, 5*; CHAS, 3; *FMNH, 2*; *USNM, 2*; *ANSP, 1*; SBCM, 1—see Stone 1900, Bailey 1930, Friedmann 1932, Bailey et al. 1933, Bailey 1948, Cade 1952, Sealy et al. 1971, Kessel and Gibson 1978, Gibson 1981).

HAEMATOPODIDAE

Haematopus bachmani Audubon, 1838 {mouth of the Columbia River}. Black Oystercatcher.

RECURVIROSTRIDAE

Himantopus himantopus [*himantopus* (Linnaeus, 1758) {southern Europe}]. Black-winged Stilt. One record (no specimen): Nizki Island, Aleutians, 24 May–3 June 1983—Zeillemaker et al. (1985), including published photo.

Recurvirostra americana Gmelin, 1789 {North America}. American Avocet. One record (no specimen; UAM photos): Valdez, 12–18 May 1981—Gibson and Kessel (1992).

GLAREOLIDAE

Glareola maldivarum Forster, 1795 {open sea, in the latitude of the Maldive Islands}. Oriental Pratincole. One specimen (*UAM 5237*): Attu Island, Aleutians, 19–20 May 1985—Gibson and Kessel (1992).

SCOLOPACIDAE

Tringa nebularia (Gunnerus, 1767) {Norway}. Common Greenshank. Five specimens (*UAM, 4*; *USNM, 1* —see Sladen 1966, Byrd et al. 1978, Gibson 1981).

Tringa melanoleuca (Gmelin, 1789) {Labrador}. Greater Yellowlegs.

Tringa flavipes (Gmelin, 1789) {New York}. Lesser Yellowlegs.

Tringa stagnatilis (Bechstein, 1803) {Germany}. Marsh Sandpiper. One record (*UAM 2820*): Buldir Island, Aleutians, 2 September 1974—Byrd et al. (1978).

Tringa erythropus (Pallas, 1764) {Holland}. Spotted Redshank. Five specimens (*UAM, 3*; *USNM, 2*—see Sladen 1966, Byrd et al. 1978, Gibson 1981).

Tringa glareola Linnaeus, 1758 {Sweden}. Wood Sandpiper. At least 27 specimens (*UAM, 11*; *USNM, 10*; *MVZ, 2*; SCK, 2; *CAS, 1*; SBCM, 1—see Littlejohn 1904, Hanna 1916, Kenyon 1961, Kenyon and Phillips 1965, Byrd et al. 1974, Pitelka 1974, White et al. 1974, Gibson 1981).

Tringa ochropus Linnaeus, 1758 {Sweden}. Green Sandpiper. Multiple records (no specimen; UAM photos)—Gibson and Kessel (1992).

Tringa solitaria solitaria Wilson, 1813 {Pocono Mountains, Pennsylvania}. Solitary Sandpiper. Smaller; much more distinctly spotted dorsally in adult nuptial plumage, white tail-bars broader (Conover 1944); southern. One record (MCZ 321489): Griffin Point, N Alaska, 1 June 1914—Brooks (1915).

T. s. cinnamomea (Brewster, 1890) {San José del Cabo, Baja California Sur}. Larger; much less distinctly spotted dorsally with whitish; white tail-bars narrower; northern; the Alaska-breeding subspecies.

Heteroscelus incanus (Gmelin, 1789) {Moorea, Society Islands, Polynesia}. Wandering Tattler.

Heteroscelus brevipes (Vieillot, 1816) {Timor, Indonesia}. Gray-tailed Tattler. At least 17 specimens (*UAM, 9*; *USNM, 4*; *CAS, 1*; *LACM, 1*; *MVZ, 1*; SCK, 1—see Hanna 1920a, b; Friedmann 1933; Byrd et al. 1978; Kessel and Gibson 1978; Gibson 1981).

Actitis hypoleucos (Linnaeus, 1758) {Sweden}. Common Sandpiper. Five specimens (*UAM, 3*; *USNM, 2*—Thompson and DeLong 1969, Byrd et al. 1978, Gibson 1981).

Actitis macularia (Linnaeus, 1766) {Pennsylvania}. Spotted Sandpiper.

Xenus cinereus (Güldenstädt, 1775) {Caspian Sea, near mouth of Terek River}. Terek Sandpiper. Five specimens (*UAM, 4*; *UWBM, 1*—see Byrd et al. 1978, Kessel and Gibson 1978, Gibson 1981).

Bartramia longicauda (Bechstein, 1812) {North America}. Upland Sandpiper.

Numenius minutus Gould, 1841 {New South Wales, Australia}. Little Curlew. One record (*UAM 5617*): St. Lawrence Island, Bering Sea, 7–8 June 1989—Gibson and Kessel (1992).

Numenius borealis (Forster, 1772) {Albany River mouth, James Bay, Ontario}. Eskimo Curlew. At least 15 extant Alaska specimens, collected 1841–1886 (*USNM, 8*; BMNH, 3; *MVZ, 2*; Univ. Mus. Zool., Helsinki, 1; ZIAS, 1—Turner 1886, Sharpe 1896, Palmer 1899, Hahn 1963). No Alaska record since 1886, when *USNM 110184* was collected on 25 May—not 1866 (Gabrielson and Lincoln 1959:350) and not 1885 (Greenway 1967:265). Gollop et al. (1986:44) estimated that "24±" Alaska specimens "have existed."

*Numenius phaeopus variegatus** (Scopoli, 1786) {Luzon, Philippines}. Whimbrel. Dark-centered white back feathers; Siberia; migrant through western Aleutians, has occurred Bering Sea islands and N Alaska. At least 15 specimens (*UAM, 9*; *USNM, 4*; *DMNH, 1*; *SCK, 1*—see Bailey 1939, Gabrielson 1952, Sladen 1966, Gibson 1981).

*N. p. hudsonicus** Latham, 1790 {Hudson Bay}. Concolor gray-brown dorsally, head to tail. The North American subspecies and widespread breeder on the Alaska mainland. Probably specifically distinct from *variegatus* (Zink et al. 1995).

Numenius tahitiensis (Gmelin, 1789) {Tahiti}. Bristle-thighed Curlew.

Numenius madagascariensis (Linnaeus, 1766) {"Madagascar" = error for Macassar, now Ujung Pandang, Sulawesi, Indonesia}. Far Eastern Curlew. Two specimens (*UAM, 1*; *USNM, 1*—Thompson and DeLong 1969, Byrd et al. 1974).

*Limosa limosa melanuroides** Gould, 1846 {Port Essington, Australia}. Black-tailed Godwit. Five specimens (*UAM, 3*; *FMNH, 1*; *MCZ, 1*—Jones and Gibson 1975, Byrd et al. 1978, Kessel and Gibson 1978, Gibson 1981).

Limosa haemastica (Linnaeus, 1758) {Hudson Bay}. Hudsonian Godwit.

*Limosa lapponica baueri** Naumann, 1836 {Australia}. Bar-tailed Godwit.

*Limosa fedoa beringiae** Gibson and Kessel, 1989 {Ugashik Bay, Alaska Peninsula, Alaska}. Marbled Godwit. Eleven specimens (*UAM, 7*; *USNM, 4*).

Arenaria interpres interpres (Linnaeus, 1758) {Sweden}. Ruddy Turnstone. Darker dorsally, with more black; breeds Chukchi and Bering seacoasts. The name *oahuensis* (Bloxham, 1826) {Oahu Island, Hawaii} "may prove to be valid for Pacific populations" (K. C. Parkes in litt., 1996).

A. i. morinella (Linnaeus, 1766) {coast of Georgia}. Paler dorsally; breeds from Alaska coast of Beaufort Sea east (AOU 1957, Vaurie 1965).

Arenaria melanocephala (Vigors, 1829) {northwest coast of North America}. Black Turnstone.

Aphriza virgata (Gmelin, 1789) {Prince William Sound, Alaska}. Surfbird.

Calidris tenuirostris (Horsfield, 1821) {Java}. Great Knot. Three specimens (*UAM, 2*; *DMNH, 1*—Bailey 1924, Byrd et al. 1974, Kessel and Gibson 1978).

Calidris canutus roselaari Tomkovich, 1990 {Wrangel Island, Chukchi Sea}. Red Knot. Alaska birds were previously maintained under nominate *canutus* (Linnaeus, 1758) {Sweden}.

Calidris alba (Pallas, 1764) {coast of the North Sea}. Sanderling.

Calidris pusilla (Linnaeus, 1766) {Hispaniola}. Semipalmated Sandpiper.

Calidris mauri (Cabanis, 1857) {South Carolina}. Western Sandpiper.

Calidris ruficollis (Pallas, 1776) {Kulussutai, eastern Siberia}. Red-necked Stint.

Calidris minuta (Leisler, 1812) {Germany}. Little Stint. Six specimens (*UAM, 5*; *USNM, 1*—Gibson and Kessel 1992).

Calidris temminckii (Leisler, 1812) {Germany}. Temminck's Stint. Seven specimens (*UAM, 5*; *SCK, 1*; *USNM, 1*—see Thompson and DeLong 1969, Byrd et al. 1978, Gibson 1981).

Calidris subminuta (Middendorff, 1851) {Stanovoi Mountains, eastern Siberia}. Long-toed Stint. At least 13 specimens (*UAM, 11*; *USNM, 2*—Townsend 1887, Byrd et al. 1978, Kessel and Gibson 1978, Gibson 1981).

Calidris minutilla (Vieillot, 1819) {Halifax, Nova Scotia}. Least Sandpiper.

Calidris fuscicollis (Vieillot, 1819) {Paraguay}. White-rumped Sandpiper.

Calidris bairdii (Coues, 1861) {Fort Resolution, Northwest Territories}. Baird's Sandpiper.

Calidris melanotos (Vieillot, 1819) {Paraguay}. Pectoral Sandpiper.

Calidris acuminata (Horsfield, 1821) {Java}. Sharp-tailed Sandpiper.

Calidris maritima (Brünnich, 1764) {Denmark and Norway}. Purple Sandpiper. One record (*UAM 5720*): Point Barrow, 29 September 1990—Gibson and Kessel (1992).

*Calidris ptilocnemis ptilocnemis** (Coues, 1873) {St. George Island, Pribilofs}. Rock Sandpiper. Largest; pale (gray) throughout, with more prominent wing-stripe; breeds Pribilofs and St. Matthew and Hall islands.

*C. p. couesi** (Ridgway, 1880) {Attu Island, Aleutians}. Smaller; darker gray, with narrower reddish or orangeish edging on dorsum; Aleutian Islands.

C. p. quarta (Hartert, 1920) {Bering Island, Commander Islands}. Smaller; darker gray, with broader, pale orange edgings on dorsum; two specimens (*DMNH, 1*; *USNM, 1*—see Bailey 1948).

*C. p. tschuktschorum** (Portenko, 1937) {Uelen, Chukotsk Peninsula, Siberia}. Smaller; darker; blacker dorsally, with reddish edging; Bering Sea coasts of northeastern Asia and mainland Alaska, St. Lawrence and Nunivak islands.

*Calidris alpina pacifica** (Coues, 1861) {Simiahmoo, Washington}. Dunlin. Longer billed; breeds W and Bering coast of mainland SW Alaska.

*C. a. arcticola** (Todd, 1953) {Point Barrow, Alaska}. Shorter billed; breeds N Alaska. Browning (1977, 1991) re-evaluated subspecies of *C. alpina* in North America and eastern Siberia. Migrants in western Aleutians, whence too few specimens for helpful comparison, are of eastern Siberian origin (Gibson 1981, Browning 1991), either *sakhalina* (Vieillot, 1816) {locality of neotype Kanchalan River, Chukotka} or *kistchinski* Tomkovich, 1986 {Maroshechnaya River, Kamchatka}.

Calidris ferruginea (Pontoppidan, 1763) {Denmark}. Curlew Sandpiper. At least five specimens (*MVZ, 3*; *UAM, 2*—Holmes and Pitelka 1964, Kessel and Gibson 1978).

Calidris himantopus (Bonaparte, 1826) {Long Branch, New Jersey}. Stilt Sandpiper.

Eurynorhynchus pygmeus (Linnaeus, 1758) {"Surinam" = error for eastern Asia}. Spoonbill Sandpiper. Three specimens (*LACM, 1*; *UAM, 1*; UCLA, 1—Dixon 1918, Day et al. 1979).

Limicola falcinellus sibirica Dresser, 1876 {Siberia and China}. Broad-billed Sandpiper. Three *UAM* specimens (Day et al. 1979, Gibson 1981).

Tryngites subruficollis (Vieillot, 1819) {Paraguay}. Buff-breasted Sandpiper.

Philomachus pugnax (Linnaeus, 1758) {Sweden}. Ruff. There is one 19th-century specimen (*ZIAS 52155*), a first-autumn bird collected 26 August 1842 at Kenai by I. G. Voznesenskii, and there are at least eighteen 20th-century specimens (*UAM, 9*; *USNM, 5*; SCK, 3; SBCM, 1—see Evermann 1913, Friedmann 1934a, Murie 1936, Sealy et al. 1971, Byrd et al. 1978, Kessel and Gibson 1978).

Limnodromus griseus caurinus Pitelka, 1950 {Yakutat, Alaska}. Short-billed Dowitcher.

Limnodromus scolopaceus (Say, 1823) {Council Bluffs, Iowa}. Long-billed Dowitcher.

Lymnocryptes minimus (Brünnich, 1764) {Denmark}. Jack Snipe. One record (*CAS 20719*): St. Paul Island, Pribilofs, "during the spring of 1919, probably in April" (Hanna 1920b:173), but "Sept–Dec 1919" on specimen label.

*Gallinago gallinago gallinago** (Linnaeus, 1758) {Sweden}. Common Snipe. Outer rectrices broad, underwing coverts and axillaries immaculate white or nearly so, dorsal edgings usually broad and buffy; migrant in Aleutians and Pribilofs, has reached St. Lawrence Island. At least 16 specimens (*USNM, 11*; *UAM, 5*—see Kenyon and Phillips 1965, Byrd et al. 1978, Gibson 1981).

*G. g. delicata** (Ord, 1825) {Pennsylvania}. Outer rectrices narrow, underwing coverts and axillaries densely barred; darker, more contrasty dorsally, with usually narrow whitish edgings; breeds Alaska mainland. Probably specifically distinct from *G. gallinago* (Miller 1996).

Gallinago stenura (Bonaparte, 1830) {Sunda Archipelago}. Pin-tailed Snipe. One record (*UAM 5820*): Attu Island, Aleutians, 25 May 1991—Gibson and Kessel (1992).

Phalaropus tricolor (Vieillot, 1819) {Paraguay}. Wilson's Phalarope. Four specimens (*UAM, 3*; MVZ, 1—see Pitelka 1974).

Phalaropus lobatus (Linnaeus, 1758) {Hudson Bay}. Red-necked Phalarope.

Phalaropus fulicaria (Linnaeus, 1758) {Hudson Bay}. Red Phalarope.

LARIDAE

Stercorarius pomarinus (Temminck, 1815) {arctic Europe}. Pomarine Jaeger.

Stercorarius parasiticus (Linnaeus, 1758) {Scandinavian coast}. Parasitic Jaeger.

Stercorarius longicaudus pallescens Løppenthin, 1932 {northeastern Greenland}. Long-tailed Jaeger. The paler, Nearctic subspecies (Manning 1964, Cramp and Simmons 1983).

Catharacta maccormicki (Saunders, 1893) {Possession Island, Victoria Land}. South Polar Skua. One specimen (*UAM 3635*): off Middleton Island, Gulf of Alaska, found dead aboard ship 1 November 1977—Kessel and Gibson (1978).

Larus pipixcan Wagler, 1831 {Mexico}. Franklin's Gull. Two *UAM* specimens (Heinl 1997).

Larus ridibundus Linnaeus, 1766 {England}. Black-headed Gull. Monotypic (Vaurie 1965). Twelve specimens (*USNM, 6*; *UAM, 4*; SBCM, 2—see Murie 1945, Kenyon and Phillips 1965, Bartonek and Gibson 1972, Byrd et al. 1974, Kessel and Gibson 1978, Byrd and Day 1986).

Larus philadelphia (Ord, 1815) {near Philadelphia, Pennsylvania}. Bonaparte's Gull.

Larus heermanni Cassin, 1852 {San Diego, California}. Heermann's Gull. One specimen (*UAM 6952*): Sitka, 16 September 1996, P. J. Walsh and T. J. Doyle.

Larus crassirostris Vieillot, 1818 {Nagasaki, Japan}. Black-tailed Gull. Multiple records (no specimen; photos UAM and Am. Birds 47:166, 1993; Natl. Aud. Soc. Field Notes 50:97, 1996; Heinl 1997)—see Gibson and Kessel (1992), Heinl (1997).

*Larus canus brachyrhynchus** Richardson, 1831 {Great Bear Lake, Northwest Territories}. Mew Gull. Smaller, with small bill and paler mantle; the "Short-billed Gull," which breeds throughout the Alaska taiga.

*L. c. kamtschatschensis** (Bonaparte, 1854) {Kamchatka}. Larger, with larger bill and darker mantle; visitant in western Aleutians. Two *UAM* specimens (Byrd et al. 1978, Gibson and Kessel 1992). Perhaps specifically distinct from *L. c. brachyrhynchus* (Zink et al. 1995) and from *L. c. canus* Linnaeus, 1758 {Sweden} (Sibley and Monroe 1990). *Larus canus* (sensu AOU 1983) may comprise three species.

Larus delawarensis Ord, 1815 {Delaware River, below Philadelphia}. Ring-billed Gull. Four *UAM* specimens (see Heinl 1997).

*Larus californicus californicus** Lawrence, 1854 {near Stockton, California}. California Gull. Smaller (bill, wing, tarsus); adult darker mantled; breeds Great Basin. At least two *UAM* specimens (see Heinl 1997); others (*UAM, 9*) are molting adults that seem to be this smaller subspecies. We did not locate four specimens of this species reported by Bailey (1927) or one reported by Willett (1923).

*L. c. albertaensis** Jehl, 1987 {Frog Lake, Alberta}. Larger, paler mantled; breeds Great Slave Lake to northern Great Plains. One specimen (*UAM 2802*): Wrangell, 21 July 1974—Kessel and Gibson (1978).

*Larus argentatus smithsonianus** Coues, 1862 {east and west coasts of North America}. Herring Gull. Paler mantled, with dull-black wingtips; the North American subspecies.

*L. a. vegae** Palmén, 1887 {Pidlin, near Pitlekai, Chukotsk Peninsula}. Slightly darker mantled than *smithsonianus*, with glossy black wingtips; northeastern Asia; also breeds St. Lawrence Island. See remarks under *L. glaucoides thayeri* and under *L. hyperboreus barrovianus*.

*Larus glaucoides glaucoides** Meyer, 1822 {Iceland}. Iceland Gull. Bailey et al. (1933) discussed two Barrow specimens (FMNH, 2) as "*L. leucopterus*" (sensu AOU 1931 = [*L. g.*] *glaucoides*).

L. g. kumlieni Brewster, 1883 {Cumberland Sound, Baffin Island}. Bailey et al. (1933) identified three Barrow specimens (FMNH, 3).

*L. g. thayeri** W. S. Brooks, 1915 {Buchanan Bay, Ellesmere Island}. We follow Godfrey (1986), Snell (1989), and Sibley and Monroe (1990) in maintaining *thayeri* as a subspecies of *L. glaucoides* instead of as a subspecies of *L. argentatus* Pontoppidan, 1763 {Denmark} (e.g., AOU 1957, Gabrielson and Lincoln 1959) or as a separate species (e.g., AOU 1983, Cramp and Simmons 1983). The three taxa included here as subspecies of *L. glaucoides* constitute a continuum of phenotypes (see Weber 1981, Godfrey 1986, Snell 1989).

Larus fuscus graellsii A. E. Brehm, 1858 {Spain}. Lesser Black-backed Gull. One specimen (*UAM 5708*): Juneau, 16–19 September 1990—Gibson and Kessel (1992). A specimen (*DMNH 9786*) collected at Icy Cape in N Alaska in 1921 was published as *L. f. taimyrensis* Buturlin, 1911 {Gulf of Yenisei}, but that identification (Bailey 1948) is problematic (Gibson and Kessel 1992).

Larus schistisagus Stejneger, 1884 {Bering Island, Commander Islands}. Slaty-backed Gull.

*Larus occidentalis occidentalis** Audubon, 1839 {Cape Disappointment, Washington}. Western Gull. Three *UAM* specimens (see Kessel and Gibson 1978, Heinl 1997).

Larus glaucescens Naumann, 1840 {North America; type is from Bering Strait (Hellmayr and Conover 1948b)}. Glaucous-winged Gull.

Larus hyperboreus barrovianus Ridgway, 1886 {Point Barrow, Alaska}. Glaucous Gull. Banks (1986a) recognized two subspecies in Alaska. Small and small billed, with darker mantle, *barrovianus* is the Alaska-breeding subspecies (except at St. Matthew and Walrus islands). "Nelson's Gull" (*L. nelsoni* Henshaw, 1884 {St. Michael, Alaska}) has been regarded since Dwight (1925) as a hybrid between *L. hyperboreus* and *L. argentatus vegae*. We agree with Jehl (1987b), however, that this phenotype is produced by more varied parentage than Dwight thought and cite the recent discovery by Spear (1987) of hybridization between *L. hyperboreus* and *L. argentatus smithsonianus* at the Mackenzie River Delta, Northwest Territories, as a likely source of such birds in N and W Alaska.

L. h. pallidissimus Portenko, 1939 {Naukan and Uelen, Chukotsk Peninsula}. Larger and paler; breeds arctic Siberia, east to St. Matthew Island, and Walrus Island in the Pribilofs (Vaurie 1965, Portenko 1973).

Larus marinus Linnaeus, 1758 {Sweden}. Great Black-backed Gull. One record (no specimen; photos UAM and Natl. Aud. Soc. Field Notes 49:182, 1995): Kodiak Island, 12 February–15 April 1995, R. A. MacIntosh and others.

Rissa tridactyla pollicaris Ridgway, 1884 {Kotzebue Sound, Alaska}. Black-legged Kittiwake.

Rissa brevirostris (Bruch, 1853) {"northwestern coast of America"}. Red-legged Kittiwake.

Rhodostethia rosea (Macgillivray, 1824) {Melville Peninsula, Northwest Territories}. Ross' Gull.

Xema sabini (Sabine, 1819) {west coast of Greenland}. Sabine's Gull. We follow Vaurie (1965) in treating this species as monotypic; *tschuktschorum* Portenko, 1939 {Uelen, Chukotsk Peninsula} and *woznesenskii* Portenko, 1939 {Hooper Bay, Alaska} are synonyms.

Pagophila eburnea (Phipps, 1774) {Spitzbergen}. Ivory Gull.

Sterna caspia Pallas, 1770 {Caspian Sea}. Caspian Tern. Three *UAM* specimens (see Gibson and Kessel 1992).

Sterna forsteri Nuttall, 1834 {Saskatchewan River}. Forster's Tern. One putative record (*CAS 43328*): a basic-plumaged bird identified by its label as having been collected on the Yukon Delta, Alaska, in June 1887 by O. J. Bates. We are skeptical of the origin of this specimen, which was long misidentified as *S. aleutica* (until 1971—L. C. Binford, on specimen label).

*Sterna hirundo longipennis** Nordmann, 1835 {Kukhtuy River mouth, Sea of Okhotsk}. Common Tern. There is a 19th-century specimen (*ZIAS 53437*), a summer adult taken at St. Paul Island, Pribilofs, in 1844 by I. G. Voznesenskii, and there are seven 20th-century specimens (*USNM, 5*; *UAM, 2*—Sladen 1966, Byrd et al. 1974, Kessel and Gibson 1978, Gibson 1981). A sighting in the eastern Aleutians in 1911 (Murie 1959) of *S. h. hirundo* Linnaeus, 1758 {Sweden}, the subspecies found elsewhere in North America, was retracted many years later by the observer (A. Wetmore in litt., 1971).

Sterna paradisaea Pontoppidan, 1763 {Denmark}. Arctic Tern.

Sterna aleutica Baird, 1869 {Kodiak Island, Alaska}. Aleutian Tern.

Chlidonias leucopterus (Temminck, 1815) {coast of the Mediterranean}. White-winged Tern. One specimen (*UAM 3533*): Nizki Island, Aleutians, 12 July 1976—Byrd et al. (1978).

Chlidonias niger surinamensis (Gmelin, 1789) {Surinam}. Black Tern. One specimen (*USNM 49889*): Fort Yukon, May (year?), W. H. Dall—whose label includes the notation "+ 2 eggs May." No evidence could be found, however, that these eggs were ever catalogued at USNM (J. P. Angle pers. comm., 1988).

ALCIDAE

Alle alle alle (Linnaeus, 1758) {Greenland}. Dovekie. Nine specimens (*UAM, 3*; *UBC, 2*; *CHAS, 1*; *MMNH, 1*; *SBCM, 1*; *USNM, 1*—Bailey 1948, Hanna 1961, Bédard 1966, Breckenridge 1966, Sealy et al. 1971, Day et al. 1988).

Uria aalge inornata Salomonsen, 1932 {St. Matthew Island, Alaska}. Common Murre.

Uria lomvia arra (Pallas, 1811) {Kamchatka}. Thick-billed Murre.

Cepphus grylle mandtii (Mandt, 1822) {Spitzbergen}. Black Guillemot.

Cepphus columba columba Pallas, 1811 {Kamchatka and Bering Strait}. Pigeon Guillemot. Larger; most of the Alaska range of the species.

C. c. kaiurka Portenko, 1937 {Copper Island, Commander Islands}. Smaller; Commander Islands, and western Aleutians east to Kiska Island.

*Brachyramphus marmoratus marmoratus** (Gmelin, 1789) {Prince William Sound, Alaska}. Marbled Murrelet. Shorter billed, smaller, darker brown in breeding plumage, paler gray in winter (Vaurie 1965; see also Erickson et al. 1995); includes *wrangelii* Brandt, 1837 {Aleutian Islands}, according to Hellmayr and Conover (1948b). The North American subspecies.

*B. m. perdix** (Pallas, 1811) {Tauisk Bay, Sea of Okhotsk}. Longer billed, larger; eastern Asia. One record (*UAM 5302*): Denali National Park, central Alaska Range, found dead 27 August 1983—Sealy et al. (1991). Probably specifically distinct from *marmoratus* (Zink et al. 1995, Friesen et al. 1996).

Brachyramphus brevirostris (Vigors, 1829) {"San Blas" [Nayarit] = "North Pacific Ocean"}. Kittlitz's Murrelet. Includes *kittlitzii* Brandt, 1837 {Petropavlovsk, Kamchatka}, according to Hellmayr and Conover (1948b).

Synthliboramphus antiquus (Gmelin, 1789) {Bering Sea}. Ancient Murrelet. Includes *seniculus* (Pallas, 1811) {"Kurile and Aleutian Islands, Kamchatka, and Penshina Bay"}, *brachypterus* Brandt, 1837 {Unalaska Island, Aleutians}, and *canus* (Kittlitz, 1858) {Amachnak [= Amaknak] Island, Aleutians}, according to Hellmayr and Conover (1948b:359).

Ptychoramphus aleuticus aleuticus (Pallas, 1811) {North Pacific Ocean}. Cassin's Auklet.

Cyclorrhynchus psittacula (Pallas, 1769) {Kamchatka}. Parakeet Auklet.

Aethia pusilla (Pallas, 1811) {Kamchatka}. Least Auklet. Includes *microceros* (Brandt, 1837) {no type locality stated} and *nodirostris* (Audubon, 1838) {"said to occur on the northwest coast"}, according to Hellmayr and Conover (1948b:363).

Aethia pygmaea (Gmelin, 1789) {"islands in Bering Sea"}. Whiskered Auklet.

Aethia cristatella (Pallas, 1769) {Hokkaido to Kamchatka; the type is from Kamchatka (Vaurie 1965)}. Crested Auklet. Includes *tetracula* (Pallas, 1769) {Kamchatka} and *dubia* (Pallas, 1811) {Avacha Bay, Kamchatka}, according to Hellmayr and Conover (1948b).

Cerorhinca monocerata (Pallas, 1811) {Cape St. Elias, Alaska}. Rhinoceros Auklet. Includes *cerorhynca* (Bonaparte, 1827) {"North Pacific"} and *cornuta* (Eschscholtz, 1829) {"Kamchatka" [Ridgway 1919: 782]}, according to Hellmayr and Conover (1948b:364).

Fratercula cirrhata (Pallas, 1769) {Bering Sea}. Tufted Puffin. Includes *carinata* (Vigors, 1829) {no type locality indicated} and *lathami* (Bonaparte, 1853) {"northwestern Arctic regions of America"}, according to Hellmayr and Conover (1948b:368).

Fratercula corniculata (Naumann, 1821) {Kamchatka}. Horned Puffin.

COLUMBIDAE

*Columba fasciata monilis** Vigors, 1839 {Monterey, California}. Band-tailed Pigeon. Three *UAM* specimens (see Kessel and Gibson 1978).

Streptopelia orientalis [*orientalis* (Latham, 1790) {China}]. Oriental Turtle-Dove. Multiple records (no specimen; photos UAM, Birding 23:192, 1991, and Natl. Aud. Soc. Field Notes 49:964, 1995)—see Gibson and Kessel (1992).

Zenaida asiatica mearnsi (Ridgway, 1915) {near Nogales, Arizona}. White-winged Dove. One record (*UAM 4207*): Skagway, October 1981—Gibson and Kessel (1992).

*Zenaida macroura marginella** (Woodhouse, 1852) {Canadian River, Oklahoma}. Mourning Dove. At least 10 specimens (*UAM, 7*; *USNM, 2*; *MVZ, 1*—see Friedmann 1931, Swarth 1922, Weeden and Johnson 1973).

CUCULIDAE

*Cuculus canorus canorus** Linnaeus, 1758 {Sweden}. Common Cuckoo. Sixteen specimens (*UAM, 15*; *USNM, 1*—see Kessel and Gibson 1978).

*Cuculus saturatus horsfieldi** Moore, 1857 {Java}. Oriental Cuckoo. Nine specimens (*UAM, 4*; *USNM, 4*; SBCM, 1—see Palmer 1894, Friedmann and Riley 1931, Murie 1936, Hanna 1947, Deignan 1951, Murie 1952, 1959).

Coccyzus americanus occidentalis Ridgway, 1887 {Old Fort Crittenden, Arizona}. Yellow-billed Cuckoo. Two records (*UAM, 2*—see Gibson and Kessel 1992). The two specimens seem to fit the larger, western subspecies, following Franzreb and Laymon (1993); Banks (1988, 1990) regarded this species as monotypic.

STRIGIDAE

Otus sunia japonicus Temminck and Schlegel, 1844 {Japan}. Oriental Scops-Owl. Two records (*UAM, 2*—see Day et al. 1979).

Otus kennicottii kennicottii (Elliot, 1867) {Sitka, Alaska}. Western Screech-Owl. At least 24 specimens (*UAM, 17*; *CU, 2*; FMNH, 1; *LACM, 1*; *MVZ, 1*; ROM, 1; *USNM, 1*—see Shortt 1939, Gabrielson and Lincoln 1959, Deignan 1961). Although described from Alaska over 100 years ago, this resident bird was known here from very few specimens until the 1980s.

*Bubo virginianus saturatus** Ridgway, 1877 {Sitka, Alaska}. Great Horned Owl. Darker than *lagophonus*, especially the upperparts; SE Alaska.

*B. v. algistus** (Oberholser, 1904) {St. Michael, Alaska}. Much paler throughout than *lagophonus*, underparts less heavily barred, the feet less heavily mottled (Gabrielson and Lincoln 1959); coast of W Alaska, Bristol Bay to Kotzebue Sound.

*B. v. lagophonus** (Oberholser, 1904) {Fort Walla Walla, Washington}. Color tone intermediate; the widespread subspecies found throughout the rest of W Alaska, and in C and SC Alaska.

Nyctea scandiaca (Linnaeus, 1758) {Lapland}. Snowy Owl.

Surnia ulula ulula (Linnaeus, 1758) {Sweden}. Northern Hawk Owl. Two specimens were identified by Ridgway (1878) as extralimital examples of this Old World subspecies. The first specimen (location?), from St. Michael, was reassessed as a pale *caparoch* (q.v.) by Ridgway (1914) but was still listed as nominate *ulula* by AOU (1957); the second (FMNH 137971), from Bethel, was dropped from the AOU Check-list in the fifth edition (ibid.). Both were mentioned by Gabrielson and Lincoln (1959).

*S. u. caparoch** (P. L. S. Müller, 1776) {Hudson Bay}. The New World subspecies, which breeds throughout the Alaska range of the species.

Glaucidium gnoma grinnelli Ridgway, 1914 {Mad River, California}. Northern Pygmy-Owl. At least 16 specimens (*UAM, 10*; FMNH, 2; *LACM, 1*; *MVZ, 1*; ROM, 1; *USNM, 1*—see Willett 1921b, Shortt 1939, Kessel and Gibson 1978). If *G. gnoma* Wagler, 1832 {Mexico} includes two species as suggested by Sibley and Monroe (1990), Alaska's pygmy-owls would be maintained under *G. californicum* Sclater, 1857 {Calaveras County, California}.

*Strix varia varia** Barton, 1799 {Philadelphia, Pennsylvania}. Barred Owl. Four *UAM* specimens (Gibson and Kessel 1992).

*Strix nebulosa nebulosa** Forster, 1772 {Severn River, Ontario}. Great Gray Owl.

Asio otus wilsonianus (Lesson, 1830) {Pennsylvania}. Long-eared Owl. Includes *tuftsi* Godfrey, 1947 {Last Mountain Lake, Saskatchewan} (see Unitt 1984). One specimen (*MVZ 9786*): Taku River, 26 September 1909—Swarth (1911).

Asio flammeus flammeus (Pontoppidan, 1763) {Sweden}. Short-eared Owl.

*Aegolius funereus richardsoni** (Bonaparte, 1838) {Bangor, Maine}. Boreal Owl. The North American subspecies; breeds throughout the Alaska taiga.

*A. f. magnus** (Buturlin, 1907) {Kolyma region and Kamchatka; the type is from the Kolyma (Vaurie 1965)}. Larger and much paler than *richardsoni*; northeastern Siberia. One record (*USNM 239184*): St. Paul Island, Pribilofs, 26 January 1911—Evermann (1913).

*Aegolius acadicus acadicus** (Gmelin, 1788) {Nova Scotia}. Northern Saw-whet Owl.

CAPRIMULGIDAE

Chordeiles acutipennis texensis Lawrence, 1857 {near Rio Grande City, Texas}. Lesser Nighthawk. One record (*UAM 5666*): Noatak River mouth, found dead 16 August 1985—Gibson and Kessel (1992).

*Chordeiles minor minor** (Forster, 1771) {South Carolina}. Common Nighthawk. At least four specimens (*UAM, 3*; *FMNH, 1*—see Bishop 1944).

*Caprimulgus vociferus vociferus** Wilson, 1812 {Philadelphia, Pennsylvania}. Whip-poor-will. One record (*UAM 2528*): West Petersburg, found dead 22 November 1972—Kessel and Gibson (1978).

*Caprimulgus indicus jotaka** Temminck and Schlegel, 1844 {Japan}. Jungle Night-jar. One record (*UAM 3585*): Buldir Island, Aleutians, found dead 31 May 1977—Day et al. (1979). For Temminck and Schlegel's year of publication, see Browning and Monroe (1991).

APODIDAE

Cypseloides niger borealis (Kennerly, 1858) {Simiahmoo Bay, Washington}. Black Swift.

Chaetura pelagica (Linnaeus, 1758) {South Carolina}. Chimney Swift. One record (*UAM 4125*): St. George Island, Pribilofs, found moribund 16 June 1981—Gibson and Kessel (1992).

Chaetura vauxi vauxi (J. K. Townsend, 1839) {Fort Vancouver, Washington}. Vaux's Swift.

Hirundapus caudacutus caudacutus (Latham, 1802) {New South Wales, Australia}. White-throated Needletail. One specimen (*USNM 526402*): Shemya Island, Aleutians, 21 May 1974—White and Baird (1977). For Latham's year of publication see Browning and Monroe (1991).

Apus apus pekinensis (Swinhoe, 1870) {Beijing, China}. Common Swift. One record (*USNM 463854*): St. Paul Island, Pribilofs, 28 June 1950—Kenyon and Phillips (1965).

*Apus pacificus pacificus** (Latham, 1802) {New South Wales, Australia}. Fork-tailed Swift. Three specimens (*CAS, 1*; *UAM, 1*; *USNM, 1*—Mailliard and Hanna 1921,

Kenyon and Phillips 1965, Gibson 1981). For Latham's year of publication see Browning and Monroe (1991).

TROCHILIDAE

Archilochus colubris (Linnaeus, 1758) {South Carolina}. Ruby-throated Hummingbird. Two records (*UAM, 1*; *USNM, 1*—see Swales 1926).

Calypte anna (Lesson, 1830) {San Francisco, California}. Anna's Hummingbird. Four *UAM* specimens.

Calypte costae (Bourcier, 1839) {Magdalena Bay, Baja California Sur}. Costa's Hummingbird. One specimen (*UAM 6150*): Auke Bay northwest of Juneau, 22 October 1992, M. E. Isleib and G. B. van Vliet.

Selasphorus rufus (Gmelin, 1788) {Vancouver Island, British Columbia}. Rufous Hummingbird.

UPUPIDAE

Upupa epops saturata Lönnberg, 1909 {Kyakhta, southern Buryat Republic, Russia}. Hoopoe. One record (*UAM 3419*): Old Chevak, Yukon-Kuskokwim Delta, 2–3 September 1975—Dau and Paniyak (1977).

ALCEDINIDAE

Ceryle alcyon (Linnaeus, 1758) {South Carolina}. Belted Kingfisher. Monotypic (Phillips et al. 1964); AOU (1957) and Gabrielson and Lincoln (1959) recognized *caurina* Grinnell, 1910 {Montague Island, Prince William Sound, Alaska}.

PICIDAE

Jynx torquilla chinensis Hesse, 1911 {China}. Eurasian Wryneck. One record (*DMNH 24570*): near Wales, found dead 8 September 1945—Bailey (1947).

Sphyrapicus varius varius (Linnaeus, 1766) {South Carolina}. Yellow-bellied Sapsucker. One specimen (*UAM 6587*): Kodiak Island, found dead 15 November 1994, M. Jacobs.

*Sphyrapicus ruber ruber** (Gmelin, 1788) {Vancouver Island, British Columbia}. Red-breasted Sapsucker. Maintained as a subspecies of *S. varius* for many years (from AOU 1931); restored to full species rank by AOU (1982). See Johnson and Zink (1983).

*Dendrocopos major kamtschaticus** (Dybowski, 1883) {Kamchatka}. Great Spotted Woodpecker. One specimen (*UAM 5337*): Attu Island, Aleutians, 27 April 1986—Wagner (1989).

*Picoides pubescens nelsoni** (Oberholser, 1896) {Nulato, Alaska}. Downy Woodpecker. Slightly larger; underparts clear white; undertail barring very reduced or obsolete; western SC (Kodiak Island, Kenai Peninsula), SW, W, and C Alaska.

*P. p. glacialis** (Grinnell, 1910) {Valdez Narrows, Prince William Sound, Alaska}. Slightly smaller; underparts smoky; undertail prominently barred with black; Prince William Sound east to SE Alaska.

*Picoides villosus septentrionalis** (Nuttall, 1840) {Saskatchewan River, Saskatchewan}. Hairy Woodpecker. Large; underparts clear white; dorsum glossy black; C and SC Alaska.

*P. v. sitkensis** (Swarth, 1911) {Etolin Island, Alexander Archipelago, Alaska}. Smaller; underparts smoky, dorsum dull black with reduced white spotting; SE Alaska.

*Picoides tridactylus fasciatus** Baird, 1870 {Fort Simpson, Northwest Territories}. Three-toed Woodpecker. Includes *alascensis* Nelson, 1884 {Nulato, Alaska}, and *fumipectus* Grinnell, 1909 {Chichagof Island, Alexander Archipelago, Alaska}, according to Cory (1919). If Old World and New World forms constitute separate species, as suggested by Zink et al. (1995), *fasciatus* would become a subspecies of *P. dorsalis* Baird, 1858 {Laramie Peak, Wyoming}.

Picoides arcticus (Swainson, 1832) {near sources of Athabaska River, Alberta}. Black-backed Woodpecker.

*Colaptes auratus luteus** Bangs, 1898 {Watertown, Massachusetts}. Northern Flicker. The Yellow-shafted Flicker of C, SC, and mainland SE Alaska. Includes *borealis* Ridgway, 1911 {Nulato, Alaska}, following Phillips et al. (1964) and Short (1965).

*C. a. cafer** (Gmelin, 1788) {Vancouver Island, British Columbia}. Formerly treated as a full species; relegated to subspecies status by AOU (1973). The Red-shafted Flicker of the southern Alexander Archipelago and adjacent mainland, where intergrades with *luteus* are known.

TYRANNIDAE

Contopus cooperi cooperi (Nuttall, 1831) {Mount Auburn, Massachusetts}. Olive-sided Flycatcher. Nomenclature follows Banks and Browning (1995); nominate *cooperi* thus replaces *C. b. borealis* (Swainson, 1832) {Carlton House, Saskatchewan}, recognized by Rea (1983) as the name for the widespread northern subspecies.

*Contopus sordidulus veliei** Coues, 1866 {Fort Whipple, Arizona}. Western Wood-Pewee. Slightly paler than *saturatus*, with yellowish flanks; C and SC Alaska.

*C. s. saturatus** Bishop, 1900 {Haines, Alaska}. Darker than *veliei*, clove brown rather than grayish brown dorsally and with flanks olivaceous (Gabrielson and Lincoln 1959); SE Alaska.

Empidonax flaviventris (Baird and Baird, 1843) {Carlisle, Pennsylvania}. Yellow-bellied Flycatcher. Five *UAM* specimens (see White and Haugh 1969).

Empidonax alnorum Brewster, 1895 {Upton, Maine}. Alder Flycatcher. "The species *E. alnorum* includes those populations listed in the last A.O.U. Check-list [1957] under *E. traillii traillii* breeding chiefly in the boreal forest region of eastern United States, Alaska, and Canada" (AOU 1973:416).

*Empidonax traillii brewsteri** Oberholser, 1918 {Nye County, Nevada}. Willow Flycatcher. Two *UAM* specimens (Gibson and Kessel 1992).

Empidonax minimus (Baird and Baird, 1843) {Carlisle, Pennsylvania}. Least Flycatcher. Five *UAM* specimens (see Gibson and Kessel 1992).

Empidonax hammondii (Xántus de Vesey, 1858) {Fort Tejon, California}. Hammond's Flycatcher.

Empidonax oberholseri Phillips, 1939 {Hart Prairie, San Francisco Mountain, Arizona}. Dusky Flycatcher. Monotypic; includes *E. o. spodius* Oberholser, 1974 {Gray, Bonneville County, Idaho}, following Browning (1974). Three *UAM* specimens (see Kessel and Gibson 1978).

Empidonax difficilis difficilis Baird, 1858 {Fort Steilacoom, Washington}. Pacific-slope Flycatcher.

Sayornis phoebe (Latham, 1790) {New York}. Eastern Phoebe. One specimen (*UAM 6711*): Mitkof Island, Alexander Archipelago, 18 June 1995, P. J. Walsh.

Sayornis saya saya (Bonaparte, 1825) {near Pueblo, Colorado}. Say's Phoebe. We follow Browning (1976) in relegating *yukonensis* Bishop, 1900 {Glacier, White Pass, Alaska} to synonymy.

Myiarchus crinitus (Linnaeus, 1758) {South Carolina}. Great Crested Flycatcher. Monotypic (Ridgway 1907, Phillips et al. 1964, Monroe 1968, Traylor 1979). One record (*UAM 5710*): Middleton Island, Gulf of Alaska, 29 September 1990—Gibson and Kessel (1992).

Tyrannus melancholicus [*satrapa* (Cabanis and Heine, 1859) {Mexico; type is from Jalapa, Veracruz} —includes *occidentalis* Hartert and Goodson, 1917 {San Blas, Nayarit}, following Traylor (1979)]. Tropical Kingbird. Multiple records (no specimen; photos UAM and Am. Birds 47:169, 1993).

Tyrannus verticalis Say, 1823 {near La Junta, Colorado}. Western Kingbird. Three *UAM* specimens (see Kessel and Gibson 1978).

Tyrannus tyrannus (Linnaeus, 1758) {South Carolina}. Eastern Kingbird. Six specimens (*UAM, 3*; CHAS, 1; *DMNH, 1*; UMMZ, 1—see Bailey et al. 1933, Bailey 1948, Kessel and Gibson 1978).

ALAUDIDAE

*Alauda arvensis pekinensis** Swinhoe, 1863 {Beijing, China}. Sky Lark. Six specimens (*UAM, 5*; SCK, 1—see Thompson and DeLong 1969, Byrd et al. 1978, Kessel and Gibson 1978, Gibson 1981).

*Eremophila alpestris flava** (Gmelin, 1789) {Yenisei River mouth}. Horned Lark. Throat and eyebrow yellow; northern Asia; casual fall migrant in W, SW, and SC Alaska. Five specimens (*UAM, 3*; *UBC, 2*—see Sealy 1968, Gibson 1981).

*E. a. arcticola** (Oberholser, 1902) {Fort Reliance, Yukon River, Yukon Territory}. Throat and eyebrow white; the Alaska-breeding subspecies.

HIRUNDINIDAE

Progne subis subis (Linnaeus, 1758) {Hudson Bay}. Purple Martin. Two specimens (CHAS, 1; *USNM, 1*—Bailey 1930, Kenyon and Phillips 1965).

Tachycineta bicolor (Vieillot, 1808) {New York}. Tree Swallow.

Tachycineta thalassina thalassina (Swainson, 1827) {Real del Monte, Hidalgo}. Violet-green Swallow. Phillips (1986) relegated *lepida* Mearns, 1902 {San Diego County, California} to synonymy.

Stelgidopteryx serripennis serripennis (Audubon, 1838) {Charleston, South Carolina}. Northern Rough-winged Swallow. Three *UAM* specimens (see Kessel and Gibson 1978).

Riparia riparia riparia (Linnaeus, 1758) {Sweden}. Bank Swallow. Includes *maximiliani* (Stejneger, 1885) {"America" = Ipswich, Massachusetts}, following Mayr and Greenway (1960) and Phillips (1986), and *ijimae* (Lönnberg, 1908) {Sakhalin}, following Phillips (1986); both were attributed to Alaska by AOU (1957) and Gabrielson and Lincoln (1959).

*Hirundo pyrrhonota pyrrhonota** Vieillot, 1817 {Paraguay}. Cliff Swallow. We follow Browning (1992) in maintaining all Alaska Cliff Swallows under nominate *pyrrhonota*.

*Hirundo rustica rustica** Linnaeus, 1758 {Sweden}. Barn Swallow. Slightly larger than *gutturalis*; white bellied, with complete chest band; Europe and Asia. Two records (*FMNH, 1*; *UAM, 1*—Bailey 1948, Phillips 1986).

*H. r. erythrogaster** Boddaert, 1783 {Cayenne}. Cinnamon bellied; has broken or faintly connected chest band; includes *palmeri* Grinnell, 1902 {Amaknak Island, Aleutians}, according to Phillips (1986). Breeds SE Alaska.

*H. r. gutturalis** Scopoli, 1786 {Panay, Philippines}. White bellied with interrupted pectoral band; Asia, east and southeast of nominate *rustica*; casual visitant in Bering Sea. At least three specimens (*UAM, 3*—see Gabrielson and Lincoln 1959, Phillips 1986).

Delichon urbica lagopoda (Pallas, 1811) {Transbaicalia}. Common House-Martin. One specimen (*UAM 3545*): Nome, 6–7 June 1974—Hall and Cardiff (1978).

CORVIDAE

Perisoreus canadensis canadensis (Linnaeus, 1758) {Canada}. Gray Jay. Dusky hood less extensive; includes *arcus* Miller, 1950 {Mount Brilliant, British Columbia}, to which all Alaska Gray Jays were assigned by Gabrielson and Lincoln (1959). Attributed to northeastern C Alaska by Phillips (1986).

P. c. pacificus (Gmelin, 1788) {Norton Sound, Alaska}. "Like [nominate] *canadensis* but dusky hood extends forward over whole crown; only forehead white, and it (usually) and nasal tufts washed with smoky brownish" (Phillips 1986:63); also browner gray below, and darker (ibid.). Includes *fumifrons* Ridgway, 1880 {St. Michael, Alaska}. Most of the Alaska range of the species.

Cyanocitta stelleri stelleri (Gmelin, 1788) {Vancouver Island, British Columbia}. Steller's Jay. Includes *borealis* Chapman, 1902 {Homer, Alaska}, according to Hellmayr (1934). Ridgway (1904) attributed *carlottae* Osgood, 1901 {Moresby Island, Queen Charlotte Islands, British Columbia} to Prince of Wales Island, SE Alaska, but we are unable to distinguish Prince of Wales Island specimens from nominate *stelleri*.

Nucifraga columbiana (Wilson, 1811) {Clearwater River, near Kamiah, Idaho}. Clark's Nutcracker. Four extant specimens examined (*UAM*, 2; *USNM*, 2—see Dall and Bannister 1869, Murie 1924). We did not locate four (?) other published specimens (Ridgway 1887a, b; Grinnell 1900; Osgood 1904; Bailey 1948; Gabrielson and Lincoln 1959).

Pica pica hudsonia (Sabine, 1823) {Cumberland House, Saskatchewan}. Black-billed Magpie. If Old World and New World forms constitute more than one species, as suggested by Zink et al. (1995), the North American birds would form the monotypic species *P. hudsonia*.

*Corvus brachyrhynchos hesperis** Ridgway, 1887 {Fort Klamath, Oregon}. American Crow. Six *UAM* specimens (Gibson and Kessel 1992).

Corvus caurinus Baird, 1858 {Fort Steilacoom, Washington}. Northwestern Crow. Probably conspecific with *C. brachyrhynchos* C. L. Brehm, 1822 {Boston, Massachusetts}, according to Rea (in Phillips 1986) and Sibley and Monroe (1990).

Corvus corax kamtschaticus Dybowski, 1883 {Kamchatka}. Common Raven. Heavier bodied, with longer tarsus, larger limb bones, and slightly more massive bill and skull; includes *behringianus* Dybowski, 1883 {Bering Island, Commander Islands} and *grebnitskii* Stejneger, 1884 {Commander Islands}, according to Rea (in Phillips 1986). Aleutians, Alaska Peninsula east to about Chignik, and northeast to at least Cape Newenham, according to Rea (op. cit.).

C. c. principalis Ridgway, 1887 {St. Michael, Alaska}. Less massive, with shorter tarsus and smaller limb bones; widespread in W, N, C, SC, and SE Alaska.

PARIDAE

Parus atricapillus turneri Ridgway, 1884 {St. Michael, Alaska}. Black-capped Chickadee.

Parus gambeli baileyae Grinnell, 1908 {Los Angeles County, California}. Mountain Chickadee. Includes *abbreviatus* (Grinnell, 1918) {Siskiyou County, California} and *grinnelli* (van Rossem, 1928) {Bonner County, Idaho}, following Phillips (1986). One specimen (*UAM 2804*): Warm Pass Valley, Coast Mountains, 6 August 1974—Kessel and Gibson (1978).

Parus cinctus lathami Stephens, 1817 {Norton Sound, Alaska}. Siberian Tit, or Gray-headed Chickadee.

Parus hudsonicus hudsonicus Forster, 1772 {Severn River, Ontario}. Boreal Chickadee. The widespread subspecies in Alaska. Includes *evura* Coues, 1884 {Nulato, Alaska}, and *stoneyi* Ridgway, 1887 {Kobuk River, Alaska}, according to Hellmayr (1934); the latter form was recognized by Phillips (1986).

P. h. columbianus Rhoads, 1893 {near Field, British Columbia}. Slightly darker and less brown above, especially on crown and hindneck; chin and throat decidedly black; bill relatively larger (Gabrielson and Lincoln 1959, Phillips 1986); Kenai Peninsula (and elsewhere in SC Alaska?).

Parus rufescens rufescens J. K. Townsend, 1837 {Fort Vancouver, Washington}. Chestnut-backed Chickadee. Includes *ferrugineus* Lundahl, 1848 {Sitka, Alaska}, according to Phillips (1986), and *vivax* (Grinnell, 1910) {Latouche Island, Prince William Sound, Alaska}, according to Hellmayr (1934).

SITTIDAE

Sitta canadensis Linnaeus, 1766 {Canada}. Red-breasted Nuthatch. Monotypic; *clariterga* Burleigh, 1960 {Clearwater County, Idaho} is not recognizable (Banks 1970, Phillips 1986, Browning 1990).

CERTHIIDAE

*Certhia americana occidentalis** Ridgway, 1882 {Simiahmoo, Washington}. Brown Creeper. Rufescent dorsally, much browner dorsally than *alascensis*, and with longer bill; SE Alaska.

*C. a. alascensis** Webster, 1986 {Fairbanks, Alaska}. A pale, gray subspecies—pale brownish gray dorsally with pale gray streaks; *montana* Ridgway, 1882 {Mount Graham, Arizona} is confined to areas south and east of Alaska (Webster, in Phillips 1986). C and SC Alaska.

TROGLODYTIDAE

*Troglodytes troglodytes meligerus** (Oberholser, 1900) {Attu Island, Aleutians}. Winter Wren. "Dark and dull below; sootier above than [races to the east]" (Phillips 1986:138); large; Near Islands, Aleutians.

*T. t. kiskensis** (Oberholser, 1919) {Kiska Island, Aleutians}. "Near *alascensis*, but bill longer" (Phillips 1986:138). Includes *tanagensis* (Oberholser, 1919) {Tanaga Island, Aleutians}, *seguamensis* Gabrielson and Lincoln, 1951 {Seguam Island, Aleutians}, *petrophilus* (Oberholser, 1919) {Unalaska Island, Aleutians}, and *stevensoni* (Oberholser, 1930) {Amak Island, Bering Sea}, following Phillips (1986); SW Alaska: Rat Islands (Kiska), Aleutians, to islands off Alaska Peninsula (Amak, Amagat).

*T. t. alascensis** Baird, 1869 {St. George Island, Pribilofs}. "Paler than *meligerus* or *helleri*; darker than *semidiensis*" (Phillips 1986:138); larger than races to the east; Pribilof Islands.

T. t. semidiensis (W. S. Brooks, 1915) {Chowiet Island, Semidi Islands, Alaska}. Palest of Alaska subspecies. "Duller, grayer than *alascensis* and bill longer" (Phillips 1986:138); larger than *helleri*; Semidi Islands. (Shumagin Islands birds are intergrades with *kiskensis*?)

T. t. helleri (Osgood, 1901) {Kodiak Island, Alaska}. "Darker above and below. Slightly paler and duller on back than *pacificus*, but averaging deeper, browner on flanks; individual variation is great, as in *kiskensis*" (Phillips 1986:138); Kodiak archipelago and Middleton Island.

T. t. ochroleucus Rea, 1986 {Admiralty Island, Alexander Archipelago, Alaska}. "Smaller and paler, less rufous below than *pacificus*" (Rea, in Phillips 1986:139); Baranof, Admiralty, Chichagof, Mitkof, and Kupreanof islands, SE Alaska. "Recognition of [this] putative subspecies cannot be confirmed until a thorough analysis of the geographic variation of the western populations is presented" (Browning 1990).

T. t. pacificus Baird, 1864 {Simiahmoo, Washington}. "The most deeply rufescent North American race" (Rea, in Phillips 1986:139), restricted to Prince of Wales Island (and Queen Charlotte Islands). Rea (loc. cit.) further stated that an unnamed subspecies, "larger and duller than *ochroleucus*," is found from the Kenai Peninsula to Haines. All Alaska material from east of the Aleutians needs to be assembled in one place and reviewed (R. W. Dickerman in litt., 1996).

CINCLIDAE

Cinclus mexicanus unicolor Bonaparte, 1827 {near source of Athabaska River, Alberta}. American Dipper.

MUSCICAPIDAE (Sylviinae)

*Locustella ochotensis ochotensis** (Middendorff, 1853) {lower Uda River, Udskaya Gulf, Sea of Okhotsk}. Middendorff's Grasshopper-Warbler. Three specimens (*CAS, 1*; SBCM, 1; *UAM, 1*—see Swarth 1928).

Locustella lanceolata (Temminck, 1840) {"Mayence" = error for Russia}. Lanceolated Warbler. One record (*UAM 5005*): Attu Island, Aleutians, 9 June 1984—Tobish (1985).

Phylloscopus sibilatrix (Bechstein, 1793) {Germany}. Wood Warbler. One record (*UAM 3695*): Shemya Island, Aleutians, 9 October 1978—Gibson (1981).

*Phylloscopus fuscatus fuscatus** (Blyth, 1842) {Calcutta, India}. Dusky Warbler. Two *UAM* specimens (Gibson 1981, Gibson and Kessel 1992).

*Phylloscopus borealis xanthodryas** (Swinhoe, 1863) {Amoy, China}. Arctic Warbler. Larger; greener above and yellower below, with longer and broader bill; includes *examinandus* Stresemann, 1913 {Bali}; breeds Sea of Okhotsk, Kamchatka, Kuriles, northern Japan; occasional in western Aleutians. At least six specimens (*UAM, 4*; *USNM, 2*—see Kenyon 1961, Gibson 1981, Phillips 1991). Two Aleutian specimens and one from the Alaska mainland were published (Gibson 1981) as *P. b. borealis* (Blasius, 1858) {Sea of Okhotsk}; the first two have been reidentified as *xanthodryas* (G. E. Watson in litt., 1983), the third as a gray example of *kennicotti* (Roberson and Pitelka 1983). See Gibson (in Phillips 1991).

*P. b. kennicotti** (Baird, 1869) {St. Michael, Alaska}. Smaller; browner above, less yellowish below, with smaller bill; the Alaska-breeding subspecies. A *Phylloscopus* found dead at Barrow (*MVZ 163410*, 15 June 1952—Pitelka 1974), originally reported to be a Willow Warbler *P. trochilus yakutensis* Ticehurst, 1935 {Yakutia, eastern Siberia}, has been reidentified as a gray *P. b. kennicotti* (Roberson and Pitelka 1983).

*Regulus satrapa olivaceus** Baird, 1864 {Simiahmoo, Washington}. Golden-crowned Kinglet. Smaller; browner on sides of head and neck, particularly on nape; back rather dark (Phillips 1991); SE Alaska.

R. s. amoenus van Rossem, 1945 {El Dorado County, California}. Larger than *olivaceus*, "coloration lighter and brighter, lower back and rump light olive green; nuchal area paler and more ashy (less olive) gray" (Gabrielson and Lincoln 1959:682); underparts paler and lacking much of the buffy or olive wash of *olivaceus*. Phillips (1991) treated it tentatively as a synonym of *apache* Jenks, 1936 {Apache County, Arizona}. Locally in SW Alaska; SC Alaska (Kodiak archipelago, Kenai Peninsula).

*Regulus calendula calendula** (Linnaeus, 1766) {Philadelphia, Pennsylvania}. Ruby-crowned Kinglet. Paler and larger; Phillips (1991) included *cineraceus* Grinnell, 1904 {Los Angeles County, California}, which was attributed to Alaska by Gabrielson and Lincoln (1959). SW, W, and C Alaska.

*R. c. grinnelli** Palmer, 1897 {Sitka, Alaska}. Darker and richer above and below than nominate *calendula*; back and rump richer greenish, a stronger ochraceous-buff wash on chest and flanks; smaller; SE Alaska west to Cook Inlet.

(Muscicapinae)

*Ficedula narcissina narcissina** (Temminck, 1835) {Japan}. Narcissus Flycatcher. Two records (*UAM, 2*—see Gibson and Kessel 1992).

*Ficedula parva albicilla** (Pallas, 1811) {Dauria near the Onon}. Red-breasted Flycatcher. Two *UAM* specimens (see Gibson and Hall 1978).

*Muscicapa sibirica sibirica** Gmelin, 1789 {near Lake Baikal}. Siberian Flycatcher. Three *UAM* specimens (see Gibson 1981).

Muscicapa griseisticta (Swinhoe, 1861) {Amoy and Taku, eastern China}. Gray-spotted Flycatcher. Four specimens (*UAM, 3*; *USNM, 1*—see Kenyon 1961, Byrd et al. 1978, Gibson 1981).

Muscicapa dauurica dauurica Pallas, 1811 {Onon River, Dauria, Siberia}. Asian Brown Flycatcher. One specimen (*UAM 5245*): Attu Island, Aleutians, 25 May 1985—Gibson and Kessel (1992). Banks and Browning (1995) explained the use of *M. dauurica* versus *M. latirostris* Raffles, 1822 {Sumatra} for this species.

(Turdinae)

Luscinia calliope (Pallas, 1776) {between the Yenisei and the Lena}. Siberian Rubythroat. Six specimens (*UAM, 4*; *USNM, 2*—see Bent 1912, Kessel and

Gibson 1978, Gibson 1981). Monotypic. We follow Vaurie (1955), who did not recognize *camtschatkensis* (Gmelin, 1789) {Kamchatka}.

Luscinia svecica svecica (Linnaeus, 1758) {Sweden and Lapland}. Bluethroat.

Luscinia cyane [*bochaiensis* (Shul'pin, 1928) {southern Ussuriland}]. Siberian Blue Robin. One record (*UAM 5238*): Attu Island, Aleutians, 21 May 1985—Gibson and Kessel (1992).

Tarsiger cyanurus [*cyanurus* (Pallas, 1773) {Yenisei}]. Red-flanked Bluetail. Two *UAM* specimens (Gibson and Kessel 1992).

Oenanthe oenanthe oenanthe (Linnaeus, 1758) {Sweden}. Northern Wheatear. Phillips (1991) discussed Alaska's wheatears under *oenanthoides* (Vigors, 1839) {"New World" = Alaska}.

*Saxicola torquatus stejnegeri** (Parrot, 1908) {Etorofu, Kuriles, and Hokkaido}. Stonechat. Two specimens (*UAM, 2*—Osborne and Osborne 1987, Gibson and Kessel 1992).

Sialia currucoides (Bechstein, 1798) {"Virginien = western America" (AOU 1957:445)}. Mountain Bluebird. For discussions of the applicability of the name *currucoides* to the Mountain Bluebird, see Phillips (1991) versus Banks and Browning (1995).

Myadestes townsendi townsendi (Audubon, 1839) {near Astoria, Oregon}. Townsend's Solitaire.

Catharus fuscescens [*salicicola* (Ridgway, 1882) {Fort Garland, Colorado}]. Veery. Multiple records (no specimen; UAM audiotape)—see Gibson and Kessel (1992).

Catharus minimus aliciae (Baird, 1858) {West Northfield, Illinois}. Gray-cheeked Thrush. Nomenclature follows Phillips (1991).

*Catharus ustulatus ustulatus** (Nuttall, 1840) {Fort Vancouver, Washington}. Swainson's Thrush. The bright cinnamon "Russet-backed Thrush" of the Alexander Archipelago, SE Alaska.

*C. u. incanus** (Godfrey, 1952) {Lapie River at Canol Road, Yukon Territory}. An "Olive-backed Thrush," the dull-olive-backed subspecies found throughout C and SC Alaska. "Olive-backed Thrushes" breeding at Hyder, southeasternmost Alaska, may prove to be *swainsoni* (Tschudi, 1845) {Carlton House, Saskatchewan}.

*Catharus guttatus guttatus** (Pallas, 1811) {Kodiak Island, Alaska}. Hermit Thrush. Like *osgoodi* but duller, grayer brown above (Phillips 1991); Pacific coast of SW and SC Alaska.

*C. g. euborius** (Oberholser, 1956) {Yukon River at Lewes River, Yukon Territory}. Brighter rufous than nominate *guttatus*; breeds in the Interior.

*C. g. osgoodi** Phillips, 1991 {Chichagof Island, Alexander Archipelago, Alaska}. "More rufescent (including tail) than other Wn races," with smaller (narrower) bill than that of *euborius*; described as intermediate between *verecundus* (Osgood, 1901) {Cumshewa Inlet, Queen Charlotte Islands, British Columbia} and nominate *guttatus*; replaces *nanus* (Audubon, 1839) {"Atlantic districts of United States"}, which name Phillips (1991:77-78) discussed as "all but universally misapplied to NW coast birds." SE Alaska. In following Phillips in choosing a type from the breeding range, we note well the following comments of K. C. Parkes (in litt., 1996): "Phillips (1991) has forcefully advocated the name *Turdus nanus* Audubon for the eastern race of the Hermit Thrush, instead of the generally used *faxoni*. He cites a number of earlier authors who have tried to make the same point, based on Audubon's statement that he had a few records of "*nanus*" from the eastern US. All of these arguments are swept away by the fact that the original watercolor of *Turdus nanus* Audubon has a clearly written note to the effect that the painted specimens (thus the type "specimen" for the name) came from the Columbia River; *nanus* unquestionably applies to a northwestern race. One has only to compare the two watercolors (*not* reproductions of the Havell plates) that Audubon did of Hermit Thrushes to see that *nanus* was not the eastern race."

Turdus obscurus Gmelin, 1789 {Lake Baikal}. Eyebrowed Thrush. Nine specimens (*UAM, 4*; *USNM, 3*; *FMNH, 1*; *MVZ, 1*—see Kenyon 1961, Sladen 1966, Pitelka 1974, Jones and Gibson 1975, Byrd et al. 1978, Gibson 1981).

*Turdus naumanni eunomus** Temminck, 1831 {Japan}. Dusky Thrush. One specimen (*UAM 3449*): Shemya Island, Aleutians, 18 May 1976—Gibson (1981).

Turdus pilaris Linnaeus, 1758 {Sweden}. Fieldfare. One specimen (*MVZ 163406*): Barrow, found dead 15 June 1968 [17 June on specimen label]—Soikkeli (1970).

*Turdus migratorius migratorius** Linnaeus, 1766 {South Carolina}. American Robin. Prominent white tail corners; most of the Alaska range of the species.

*T. m. caurinus** (Grinnell, 1909) {Admiralty Island, Alexander Archipelago, Alaska}. "Near [nominate] *migratorius*, but with very little or no white in tail corners" (Phillips 1991:55); SE Alaska.

*Ixoreus naevius naevius** (Gmelin, 1789) {Vancouver Island, British Columbia}. Varied Thrush. Female is darker above and brighter below than *meruloides*; SE Alaska.

*I. n. meruloides** (Swainson, 1832) {Fort Franklin, Northwest Territories}. Female palest above (grayest, dullest), particularly the crown; averages pale and dull below (Phillips 1991); W, SC, and C Alaska.

MIMIDAE

Mimus polyglottos polyglottos (Linnaeus, 1758) {Virginia}. Northern Mockingbird. Includes *leucopterus* (Vigors, 1839) {Monterey, California}, according to Phillips (1986). One specimen (*UAM 5354*): Fairbanks, 2 October 1986—Gibson and Kessel (1992).

Toxostoma rufum [*longicauda* (Baird, 1858) {Republican River, Kansas}]. Brown Thrasher. Three *UAM* specimens (see Kessel and Gibson 1978), but none identifiable to subspecies.

PRUNELLIDAE

Prunella montanella badia Portenko, 1929 {Chukotsk Peninsula, northeastern Siberia}. Siberian Accentor. Four specimens (*CAS, 1*; *MVZ, 1*; *UAM, 1*; *USNM, 1*—Swarth 1928, Murie 1938, Pitelka 1974, Gibson 1981).

MOTACILLIDAE

*Motacilla flava tschutschensis** Gmelin, 1789 {coasts of Chukotsk Peninsula}. Yellow Wagtail. Grayer dorsally, paler yellow ventrally, with broken pectoral band; throat usually more white than yellow; averages slightly smaller; includes *alascensis* (Ridgway, 1903) {St. Michael, Alaska}, according to Hellmayr (1935). The Alaska-breeding subspecies.

*M. f. simillima** Hartert, 1905 {Kamchatka; the type is from the Sulu Archipelago (Vaurie 1959)}. Larger; brighter green dorsally and more intensely yellow ventrally, less of a tendency to develop the broken pectoral band; throat usually more yellow than white; migrant in western Aleutians, has reached Pribilofs and St. Lawrence Island. At least nine specimens (*UAM, 4*; *USNM, 4*; *PSM, 1*—see Kenyon 1961, Thompson and DeLong 1969, Sealy et al. 1971, Gibson 1981).

*Motacilla cinerea robusta** (C. L. Brehm, 1857) {Japan}. Gray Wagtail. Four specimens (*UAM, 2*; *FMNH, 1*; *USNM, 1*—Sladen 1966, Jones and Gibson 1975, Byrd et al. 1978).

*Motacilla alba ocularis** Swinhoe, 1860 {Amoy, China}. White Wagtail. At least 14 specimens (*UBC, 6*; *UAM, 5*; *MVZ, 1*; *USNM, 1*; *UWBM, 1*—see Fay and Cade 1959, Peyton 1963, Thompson and DeLong 1969, Kessel 1989).

Motacilla lugens Gloger, 1829 {Kamchatka}. Black-backed Wagtail. Formerly maintained as a subspecies of *M. alba*; elevated to full species rank by AOU (1982), following studies in Asia (Kishchinski and Lobkov 1979; see also Badyaev et al. 1996 and citations therein). Two specimens (*MCZ, 1*; *UAM, 1*—Thayer and Bangs 1921, Gibson 1981).

Anthus trivialis trivialis (Linnaeus, 1758) {Sweden}. Tree Pipit. One specimen (*UAM 3294*): Cape Prince of Wales, 23 June 1972—Kessel (1989).

*Anthus hodgsoni yunnanensis** Uchida and Kuroda, 1916 {southern Yunnan, China}. Olive-backed Pipit. Four specimens (*UAM, 3*; *USNM, 1*—Sealy et al. 1971, Byrd et al. 1978, Gibson 1981).

*Anthus gustavi stejnegeri** Ridgway, 1883 {Commander Islands; lectotype (examined) is from Bering Island}. Pechora Pipit. Includes *commandorensis* Johansen, 1952 {Commander Islands}. Two specimens (*UAM, 1*; *USNM, 1*—see Friedmann 1938).

Anthus cervinus (Pallas, 1811) {Siberia near the Kolyma, and Kamchatka; the type is from the Kolyma (Vaurie 1959)}. Red-throated Pipit. At least 35 specimens (*UAM, 14*; *MVZ, 7*; *USNM, 5*; *MMNH, 2*; *UBC, 2*; *UWBM, 2*; CHAS, 1; SBCM, 1; *SCK, 1*—see Turner 1886, Bailey 1932; Friedmann 1937, Kenyon and Brooks 1960, Watson 1963, Breckenridge and Cline 1967, Keith 1967, Sealy et al. 1971, Byrd et al. 1978, Kessel and Gibson 1978, Gibson 1981).

*Anthus rubescens pacificus** Todd, 1935 {Red Pass, 6000 feet, British Columbia}. American Pipit. Grayer dorsally in summer, usually with much less (or browner and blurred) streaking ventrally; slightly smaller; includes *geophilus* Lea and Edwards, 1950 {Unimak Island, Aleutians}. The widespread Alaska-breeding subspecies (AOU 1957, Gabrielson and Lincoln 1959, Hall 1961, Knox 1988b). Phillips (1991) discussed nominate *rubescens* (Tunstall, 1771) {Philadelphia, Pennsylvania} as the widespread subspecies in Alaska, tentatively recognized *geophilus*, and restricted *pacificus* to regions east and south of Alaska. "Formerly regarded as group of races of *A. spinoletta* (Linnaeus, 1758)" {Italy}, the Water Pipit, from which *A. rubescens* is now maintained as a separate species (AOU 1989:536).

*A. r. japonicus** Temminck and Schlegel, 1847 {Japan}. Browner, less grayish, above; more distinctly and heavily streaked ventrally; somewhat larger; autumn birds with whitish instead of buffy wing-bars; eastern Asia; fall visitant in Bering Sea, whence there are four Alaska specimens (*UAM, 2*; *CAS, 1*; *USNM, 1*—see Swarth 1928, Kenyon 1961, Gibson 1981; cf. Webster 1978).

BOMBYCILLIDAE

*Bombycilla garrulus pallidiceps** Reichenow, 1908 {Shesly River, British Columbia}. Bohemian Waxwing. Darker. The New World subspecies.

*B. g. centralasiae** Polyakov, 1915 {southwestern Russian Altai}. Paler dorsally and ventrally, but often with darker chestnut crissum, than *pallidiceps*; Asia. Casual visitant in Aleutian and Pribilof islands. Two specimens (*UAM, 1*; *USNM, 1*—see Gibson and Kessel 1992). Originally identified as *pallidiceps* (Kenyon and Phillips 1965), *USNM 466751* has been reidentified as *centralasiae* (R. C. Banks and M. R. Browning in litt., 1994).

Bombycilla cedrorum Vieillot, 1808 {eastern North America}. Cedar Waxwing. At least six specimens (*UAM, 3*; USNM, 2; *MVZ, 1*—see Swarth 1911, Williams 1950). Browning (1990) provisionally recognized subspecies, but, if geographic variation valid, "the identity of northwestern birds [?*larifuga* Burleigh, 1963 {Clearwater County, Idaho}] is apparently not certain" (Phillips 1991).

LANIIDAE

Lanius cristatus lucionensis Linnaeus, 1766 {Luzon, Philippines}. Brown Shrike. One specimen (*UAM 3696*): Shemya Island, Aleutians, 10 October 1978—Gibson (1981).

Lanius excubitor borealis Vieillot, 1808 {New York}. Northern Shrike. Includes *invictus* Grinnell, 1900 {Kobuk River, Alaska}, following Phillips (1986).

STURNIDAE

Sturnus vulgaris vulgaris Linnaeus, 1758 {Sweden}. European Starling.

VIREONIDAE

*Vireo solitarius cassinii** Xántus de Vesey, 1858 {Fort Tejon, California}. Solitary Vireo. Two *UAM* specimens (see Gibson and Kessel 1992). Johnson (1995) discussed *cassinii* as possibly a species separate from *V. solitarius* (Wilson, 1810) {Philadelphia, Pennsylvania}.

*Vireo gilvus swainsonii** Baird, 1858 {Petaluma, California}. Warbling Vireo. At least 11 specimens (*UAM, 9*; *CAS, 1*; *SDNHM, 1*—see Jewett 1942, Webster 1950, Kessel and Gibson 1978). Phillips (1991) tentatively discussed *swainsonii* as a species separate from *V. gilvus* (Vieillot, 1808) {New York}.

Vireo philadelphicus (Cassin, 1851) {Philadelphia, Pennsylvania}. Philadelphia Vireo. One specimen (*UAM 5428*): Middleton Island, Gulf of Alaska, 29 September 1987—Gibson and Kessel (1992).

Vireo olivaceus olivaceus (Linnaeus, 1766) {South Carolina}. Red-eyed Vireo. Four specimens (*UAM, 3*; *USNM, 1*—see Rausch 1958, Kessel and Gibson 1978).

EMBERIZIDAE (Parulinae)

Vermivora peregrina (Wilson, 1811) {Cumberland River, Tennessee}. Tennessee Warbler. Nine *UAM* specimens (see Kessel and Gibson 1978).

*Vermivora celata celata** (Say, 1823) {Omaha, Nebraska}. Orange-crowned Warbler. Grayer headed and grayer backed, only streaked yellow ventrally; the widespread subspecies in C, SW, W, and N Alaska.

*V. c. lutescens** (Ridgway, 1872) {Fort Kenai, Alaska}. Bright yellow ventrally, including throat and undertail coverts, and yellow-green dorsally; SC and SE Alaska.

*Dendroica petechia rubiginosa** (Pallas, 1811) {Kodiak Island, Alaska}. Yellow Warbler. Males darker and greener above, usually with greenish forehead; SW, SC, and SE Alaska.

*D. p. banksi** Browning, 1994 {Old Crow Village, Yukon Territory}. Yellower above, especially rump and forehead; W, N, and C Alaska. AOU (1957) and Gabrielson and Lincoln (1959) discussed *amnicola* Batchelder, 1918 {Curslet, Newfoundland} as the widespread northern subspecies.

Dendroica magnolia (Wilson, 1811) {Fort Adams, Mississippi}. Magnolia Warbler. Eight specimens (*UAM, 7*; *MCZ, 1*—see Brooks 1915, Dixon 1943, Kessel and Gibson 1978).

Dendroica tigrina (Gmelin, 1789) {Canada}. Cape May Warbler. Four *UAM* specimens (see Kessel and Gibson 1978).

*Dendroica coronata auduboni** (J. K. Townsend, 1837) {near Fort Vancouver, Washington}. Yellow-rumped Warbler. Formerly maintained as a separate species, the Audubon's Warbler; relegated to subspecies status by AOU (1973). Yellow throat, gray auricular, and broader white edging in wing than in *hooveri*; breeds southern SE Alaska mainland. Six *UAM* specimens.

*D. c. hooveri** McGregor, 1899 {Palo Alto, California}. White throat, blackish auricular, reduced white edging in wing; the widespread Myrtle Warbler that breeds throughout C and SC Alaska; also breeds northern SE Alaska mainland and adjacent islands; intergrades with *auduboni* known from the Stikine River.

Dendroica townsendi (J. K. Townsend, 1837) {Fort Vancouver, Washington}. Townsend's Warbler.

*Dendroica virens virens** (Gmelin, 1789) {Philadelphia, Pennsylvania}. Black-throated Green Warbler. One record (*SDNHM 25978*): Chichagof Island, Alexander Archipelago, 18 July 1941—McCaskie (1968).

*Dendroica discolor discolor** (Vieillot, 1808) {New York}. Prairie Warbler. One specimen (*UAM 5549*): Middleton Island, Gulf of Alaska, 22 September 1988—Gibson and Kessel (1992).

*Dendroica palmarum palmarum** (Gmelin, 1789) {Hispaniola}. Palm Warbler. Seven *UAM* specimens (see Gibson and Kessel 1992).

Dendroica striata (Forster, 1772) {Severn River, Ontario}. Blackpoll Warbler. Monotypic; includes *lurida* Burleigh and Peters, 1948 {Nushagak, Alaska} as a synonym.

Mniotilta varia (Linnaeus, 1766) {Hispaniola}. Black-and-white Warbler. One specimen (*UAM 3630*): Colville River Delta, found dead mid-October 1977—Kessel and Gibson (1978).

Setophaga ruticilla tricolora (P. L. S. Müller, 1776) {Cayenne}. American Redstart. Six specimens (*UAM, 4*; *CAS, 1*; *USNM, 1*—see Burroughs 1910, Webster 1950, Gabrielson and Lincoln 1959, Kessel and Gibson 1978).

Seiurus aurocapillus [*aurocapillus* (Linnaeus, 1766) {at sea, apparently off Haiti}]. Ovenbird. Multiple records (no specimen; UAM photos)—see Gibson and Kessel (1992).

Seiurus noveboracensis (Gmelin, 1789) {New York}. Northern Waterthrush. Monotypic (Eaton 1957).

Oporornis philadelphia (Wilson, 1810) {near Philadelphia, Pennsylvania}. Mourning Warbler. Two records (*UAM, 2*—see Gibson and Kessel 1992).

Oporornis tolmiei tolmiei (J. K. Townsend, 1839) {Fort Vancouver, Washington}. MacGillivray's Warbler.

Geothlypis trichas occidentalis Brewster, 1883 {Truckee River, Nevada}. Common Yellowthroat. Slightly smaller, white forehead band narrower, upperparts more yellowish, underparts deeper and more extensively yellowish, flanks buffier (Gabrielson and Lincoln 1959); includes *arizela* Oberholser, 1899 {Fort Steilacoom, Washington}, according to Marshall and Dedrick (1994). At least 22 specimens of the species (*MVZ, 10*; *UAM, 7*; *CAS, 4*; *UU, 1*—see Swarth 1911, Webster 1950, Kessel and Gibson 1978). Southern SE Alaska (Chickamin River).

G. t. campicola Behle and Aldrich, 1947 {Rosebud County, Montana}. Slightly larger, forehead band broader, upperparts more grayish green, underparts less extensively yellowish, flanks grayish (Gabrielson and Lincoln 1959); includes *yukonicola* Godfrey, 1950 {Jarvis River at Alaska Highway, Yukon Territory}, according to Lowery and Monroe (in Paynter 1968). Northern SE Alaska mainland.

Wilsonia pusilla pileolata (Pallas, 1811) {Kodiak Island, Alaska}. Wilson's Warbler.

Wilsonia canadensis (Linnaeus, 1766) {Canada}. Canada Warbler. One specimen (*MVZ 156010*): Barrow, found dead 22 July 1965—Pitelka (1974).

(Thraupinae)

Piranga olivacea (Gmelin, 1789) {New York}. Scarlet Tanager. One record (*FMNH 177185*): Barrow, 25 June 1934—Bishop (1944).

Piranga ludoviciana (Wilson, 1811) {Idaho County, Idaho}. Western Tanager. At least seven specimens (*UAM, 5*; *FMNH, 1*; *MVZ, 1*—see Swarth 1911, Bishop 1944, Kessel and Gibson 1978).

(Cardinalinae)

Pheucticus melanocephalus melanocephalus (Swainson, 1827) {Temascaltepec, state of México}. Black-headed Grosbeak. One specimen (*UAM 6956*): Petersburg, 17 September 1996, P. J. Walsh.

Guiraca caerulea interfusa Dwight and Griscom, 1927 {Fort Lowell, Arizona}. Blue Grosbeak. One record (*UAM 5643*): Petersburg, 6–7 August 1989—Gibson and Kessel (1992).

Passerina cyanea (Linnaeus, 1766) {South Carolina}. Indigo Bunting. One specimen (*UAM 5935*): Anchorage, found dead 20 August 1991—Gibson and Kessel (1992).

(Emberizinae)

Pipilo maculatus [*arcticus* (Swainson, 1832) {Carlton House, Saskatchewan} or *curtatus* Grinnell, 1911 {Humboldt County, Nevada}]. Spotted Towhee. Multiple

records (no specimen; photos UAM and Natl. Aud. Soc. Field Notes 49:183, 1995)—Gibson and Kessel (1992).

Spizella arborea ochracea Brewster, 1882 {Fort Walla Walla, Washington}. American Tree Sparrow.

Spizella passerina arizonae Coues, 1872 {Fort Whipple, Arizona}. Chipping Sparrow. Includes *boreophila* Oberholser, 1955 {Fort Simpson, Northwest Territories}, following Phillips et al. (1964).

Spizella pallida (Swainson, 1832) {Carlton House, Saskatchewan}. Clay-colored Sparrow. Three *UAM* specimens (see Gibson and Kessel 1992).

Spizella breweri taverneri Swarth and A. Brooks, 1925 {Spruce Mountain, 10 miles east of Atlin, British Columbia}. Brewer's Sparrow. Three *UAM* specimens (Doyle 1997). Probably specifically distinct as the Timberline Sparrow, differing from *S. breweri* Cassin, 1856 {Black Hills, South Dakota} in vocalizations, morphology, and ecology (Sibley and Monroe 1990).

Chondestes grammacus [*strigatus* Swainson, 1827 {Temascaltepec, state of México}]. Lark Sparrow. One record (no specimen; UAM photos): near Scottie Creek, 12 July 1991—Gibson and Kessel (1992).

*Passerculus sandwichensis sandwichensis** (Gmelin, 1789) {Unalaska Island, Aleutians}. Savannah Sparrow. Large and large billed; *chrysops* (Pallas, 1811) {Unalaska Island} is a synonym, according to Hellmayr (1938). Eastern Aleutians and island groups off Alaska Peninsula [?to Kodiak archipelago and Middleton Island].

*P. s. anthinus** Bonaparte, 1853 {Kodiak Island, Alaska}. Smaller, and smaller billed, than nominate *sandwichensis*; includes *xanthophrys* (Grinnell, 1901) {Kodiak Island}, according to Hellmayr (1938), and *crassus* Peters and Griscom, 1938 {Sitka, Alaska}. The widespread subspecies found through most of the Alaska range of the species.

*Passerella iliaca unalaschcensis** (Gmelin, 1789) {Unalaska Island, Aleutians}. Fox Sparrow. Six dark brown Pacific coastal forms in Alaska constitute most of the *unalaschcensis* subspecies-group. This subspecies (which is extralimital at the type locality) is large; in summer adult plumage grayest—gray-brown dorsally, distinctly gray on neck and sides of head; breast spots fewer and smaller; bill large; easternmost Aleutians (Unimak); western Alaska Peninsula; Sanak, Shumagin, and Semidi islands.

*P. i. insularis** Ridgway, 1900 {Kodiak, Alaska}. Large; summer adult browner, the back light sepia, grayish on neck and sides of head; breast spots dense and large; bill large; Kodiak archipelago.

*P. i. sinuosa** Grinnell, 1910 {Knight Island, Prince William Sound, Alaska}. Large; summer adult redder brown above (without grayish); breast spots dense and large; bill slightly smaller; northern Gulf of Alaska coast from Cook Inlet at least to Cape Yakataga, and at Middleton Island, Gulf of Alaska.

P. i. annectens Ridgway, 1900 {Yakutat, Alaska}. Smaller; summer adult apparently like *insularis*, but smaller, especially the bill, and coloration slightly browner (Ridgway 1901); northeastern Gulf of Alaska coast (Yakutat Bay). We have seen only two August specimens collected near the end of molt (SDNHM), not comparable with UAM worn breeding specimens.

*P. i. townsendi** (Audubon, 1839) {Fort Vancouver, Washington}. Smaller; dark and deeply rufescent; chest spots large and profuse; Alexander Archipelago, SE Alaska.

*P. i. chilcatensis** Webster, 1983 {7 miles south-southwest of Klukwan, Alaska, near Tsirku River}. Smaller; blacker, less reddish; breast spots dense and large; mainland SE Alaska.

*P. i. zaboria** Oberholser, 1946 {Circle, Alaska}. The widespread Fox Sparrow north of the Pacific coast. Represents the *iliaca* subspecies-group—gray-and-rufous-backed with rufous breast spots. Breeds throughout C and in W and N Alaska. Intergrades with *unalaschcensis* and *sinuosa* at the base of the Alaska Peninsula

(see Williamson and Peyton 1962) and with *sinuosa* in the Cook Inlet area and in the Copper River valley.

*Melospiza melodia maxima** Gabrielson and Lincoln, 1951 {Kiska Island, Aleutians}. Song Sparrow. Large; browner than *sanaka*, with slightly heavier and longer bill; resident in the western and central Aleutians (Attu to Atka, possibly Amlia).

*M. m. sanaka** McGregor, 1901 {Sanak Island, Sanak Islands, Alaska}. Large; grayer than far-western *maxima* and with more slender bill; includes *semidiensis* W. S. Brooks, 1919 {North Semidi Island [= Aghiyuk Island], Semidi Islands, Alaska}, according to Hellmayr (1938), and we tentatively include *amaka* Gabrielson and Lincoln, 1951 {Amak Island, Alaska}, although we have seen only a few (all?) specimens (*USNM, 6*; *UAM, 1*—see Gabrielson and Lincoln 1951). *Fringilla cinerea* Gmelin, 1789 {Unalaska Island, Aleutians} is a senior synonym but preoccupied (AOU 1908). Resident from the central Aleutians (Seguam) to the Alaska Peninsula and adjacent island groups (Sanak, Shumagin, and Semidi islands).

*M. m. insignis** Baird, 1869 {Kodiak Island, Alaska}. Medium sized; darker than *sanaka*, paler and grayer than *kenaiensis*; Kodiak archipelago and adjacent Alaska Peninsula coast. This and the following four subspecies are migratory, as well as resident throughout the year in reduced numbers.

*M. m. kenaiensis** Ridgway, 1900 {Port Graham, Cook Inlet, Alaska}. Smaller and browner than *insignis*, larger than *caurina*; Pacific coast of Kenai Peninsula, islands of Prince William Sound.

*M. m. caurina** Ridgway, 1899 {Yakutat, Alaska}. Small; grayer and with longer bill than *rufina*; northern Gulf of Alaska coast.

*M. m. rufina** (Bonaparte, 1851) {Sitka, Alaska}. Small; darker (sootier and less rufous) than *inexspectata*; includes *kwaisa* Cumming, 1933 {Langara Island, Queen Charlotte Islands, British Columbia}, according to Hellmayr (1938). Outer islands of Alexander Archipelago.

*M. m. inexspectata** Riley, 1911 {near Moose Lake, British Columbia}. Small; dark with rufous tones; SE Alaska mainland and inner islands of Alexander Archipelago.

Melospiza lincolnii lincolnii (Audubon, 1834) {Labrador = near mouth of Natashquan River, Quebec}. Lincoln's Sparrow. Larger; includes *alticola* (Miller and McCabe, 1935) {San Bernardino County, California}, following Phillips et al. (1964) and citations therein; breeds C, SW, and W Alaska.

M. l. gracilis (Kittlitz, 1858) {Sitka, Alaska}. Smaller, possibly with a "buff overcast on the head and nape" (Phillips et al. 1964); Pacific coastal Alaska, Prince William Sound east through SE Alaska.

Melospiza georgiana ericrypta Oberholser, 1938 {Fort McMurray, Alberta}. Swamp Sparrow. Two *UAM* specimens (Gibson and Kessel 1992).

Zonotrichia albicollis (Gmelin, 1789) {Philadelphia, Pennsylvania}. White-throated Sparrow. One specimen (*UAM 5450*): Juneau, 24 November 1987, M. E. Isleib.

Zonotrichia atricapilla (Gmelin, 1789) {Prince William Sound, Alaska}. Golden-crowned Sparrow. Includes *coronata* (Pallas, 1811) {Kodiak Island, Alaska}, according to Hellmayr (1938).

Zonotrichia leucophrys leucophrys (Forster, 1772) {Severn River, Ontario}. White-crowned Sparrow. Black lores. One record (*USNM 435476*): Tolugak Lake, Brooks Range, 11 July [not June] 1950—Gabrielson and Lincoln (1959).

*Z. l. gambelii** (Nuttall, 1840) {Walla Walla, Washington}. White lores; includes *intermedia* Ridgway, 1873 {Fort Kenai, Alaska}, according to Hellmayr (1938). Breeds throughout the Alaska range of the species.

Zonotrichia querula (Nuttall, 1840) {near Independence, Missouri}. Harris' Sparrow. Five specimens (*UAM, 3*; *MVZ, 1*; *USNM, 1*—see Myres 1959, Pitelka 1974, Winker and Klicka 1991).

*Junco hyemalis hyemalis** (Linnaeus, 1758) {South Carolina}. Dark-eyed Junco. The Slate-colored Junco, which breeds throughout the Alaska range of the species except SE, where replaced by *oreganus*.

*J. h. oreganus** (J. K. Townsend, 1837) {Fort Vancouver, Washington}. Formerly maintained as a separate species, the Oregon Junco; relegated to subspecies rank by AOU (1973). Rufous back, bright rufous flanks, dark hood; SE Alaska.

J. h. cismontanus Dwight, 1918 {Sumas, British Columbia}. Intermediate between nominate *hyemalis* and *oreganus*; migration (from Yukon Territory?) and winter in SE Alaska. See Browning (1974), who followed Phillips (1962) in renaming this population *henshawi* {Bennett, British Columbia}, on the subject of "*cismontanus*" the hybrid versus *cismontanus* the subspecies. One additional subspecies has been reported from Alaska, Osgood's (1909) identification of *montanus* Ridgway, 1898 {Columbia Falls, Montana} from the Yukon River in eastern C Alaska.

*Calcarius lapponicus alascensis** Ridgway, 1898 {St. Paul Island, Pribilofs}. Lapland Longspur. Male browner dorsally; black of flanks reduced, not broadly connected to black of throat; supercilium ochre; throughout the Alaska breeding range of the species.

*C. l. coloratus** Ridgway, 1898 {Copper Island, Commander Islands}. Slightly larger. Male much blacker dorsally; wing-coverts chestnut; black of throat connects solidly with black flanks; supercilium whitish; Commander Islands and Kamchatka. One specimen (*UAM 5239*): Attu Island, Aleutians, 1 June 1985—Gibson (1986).

Calcarius pictus (Swainson, 1832) {Carlton House, Saskatchewan}. Smith's Longspur. Monotypic. Kemsies' (1961) subspecies, including *roweorum* {Anaktuvik [= Anaktuvuk], Alaska}, were based on different degrees of plumage wear and cannot be recognized (Jehl 1968, Browning 1990).

*Emberiza leucocephalos leucocephalos** Gmelin, 1771 {Astrakhan, Russia}. Pine Bunting. One specimen (*UAM 6385*): Attu Island, Aleutians, 6 October 1993, D. D. Gibson.

Emberiza pusilla Pallas, 1776 {Daurian Alps, Transbaicalia}. Little Bunting. Two specimens (*UAM, 1*; *USNM, 1*—Watson et al. 1974, Gibson 1981).

*Emberiza rustica latifascia** Portenko, 1930 {near Klyuchi, Kamchatka}. Rustic Bunting. There is one 19th-century specimen, a summer male (*ZIAS 41346*) taken in 1843 at St. Paul Island, Pribilofs, by I. G. Voznesenskii, and there are at least ten 20th-century specimens (*UAM, 5*; *USNM, 4*; *UWBM, 1*—see Bent 1912, Kenyon 1961, Gibson 1981).

*Emberiza aureola ornata** Shul'pin, 1928 {Suifun River mouth, north of Vladivostok}. Yellow-breasted Bunting. One specimen (*UAM 5465*): Attu Island, Aleutians, 26 May 1988—Gibson and Kessel (1992).

Emberiza variabilis Temminck, 1835 {northern Japan}. Gray Bunting. One specimen (*UAM 3573*): Shemya Island, Aleutians, 18 May 1977—Gibson and Hall (1978).

*Emberiza pallasi polaris** Middendorff, 1851 {Boganida River, Taimyr Peninsula}. Pallas' Bunting. One specimen (*MVZ 163423*): Barrow, 11 June 1968—Pitelka (1974).

*Emberiza schoeniclus pyrrhulina** (Swinhoe, 1876) {Hakodate, Hokkaido}. Reed Bunting. Two *UAM* specimens (Byrd et al. 1978, Gibson 1981).

*Plectrophenax nivalis nivalis** (Linnaeus, 1758) {Lapland}. Snow Bunting. Smaller; the Alaska range of the species except for the Pribilof, Aleutian, and Shumagin islands.

*P. n. townsendi** Ridgway, 1887 {Otter Island, Pribilofs}. Larger, with relatively longer bill; Pribilof, Aleutian, and Shumagin islands.

Plectrophenax hyperboreus Ridgway, 1884 {St. Michael, Alaska}. McKay's Bunting.

(Icterinae)

Dolichonyx oryzivorus (Linnaeus, 1758) {South Carolina}. Bobolink. Two records (*MVZ, 1*; *UAM, 1*—see Kessel and Gibson 1978).

*Agelaius phoeniceus arctolegus** Oberholser, 1907 {Fort Simpson, Northwest Territories}. Red-winged Blackbird. At least 15 specimens (*UAM, 8*; *CAS, 3*; MVZ,

2; CHAS, 1; FMNH, 1—see Bailey 1930, 1948; Webster 1948; Kessel 1966; Kessel and Gibson 1978; Webster 1978, 1988).

Sturnella neglecta neglecta Audubon, 1844 {Old Fort Union, North Dakota}. Western Meadowlark. Three specimens (*LACM, 1*; *UAM, 1*; *USNM, 1*—see Willett 1923, Hemming 1965).

Xanthocephalus xanthocephalus (Bonaparte, 1826) {Nance County, Nebraska}. Yellow-headed Blackbird. Two specimens (*MVZ, 1*; *UAM, 1*—Kessel and Gibson 1978).

Euphagus carolinus carolinus (P. L. S. Müller, 1776) {Carolina}. Rusty Blackbird.

Euphagus cyanocephalus (Wagler, 1829) {Mexico; the type is from Temascaltepec, state of México (Hellmayr 1937)}. Brewer's Blackbird. Widely regarded as monotypic. If the tentative revision by Rea (1983) should be followed, it is not clear to which subspecies Alaska specimens should be assigned. Three specimens (*DMNH, 2*; *UAM, 1*—see Bailey 1948).

*Quiscalus quiscula versicolor** Vieillot, 1819 {United States}. Common Grackle. Two specimens (*DMNH, 1*; *MVZ, 1*—Bailey 1948, Kessel and Gibson 1978).

*Molothrus ater artemisiae** Grinnell, 1909 {Humboldt County, Nevada}. Brown-headed Cowbird. At least nine specimens (*UAM, 7*; MVZ, 1; *USNM, 1*—see Stewart 1964, Pitelka 1974, Kessel and Gibson 1978). Originally published (Stewart 1964) as eastern *M. a. ater* (Boddaert, 1783) {South Carolina}, *USNM 479397* has been reidentified as *artemisiae*.

FRINGILLIDAE

Fringilla montifringilla Linnaeus, 1758 {Sweden}. Brambling. At least 15 specimens (*UAM, 10*; *USNM, 2*; *UWBM, 2*; *FMNH, 1*—see Hanna 1916, Kenyon 1961, Byrd et al. 1974, Jones and Gibson 1975, Kessel and Gibson 1978, Gibson 1981).

*Leucosticte tephrocotis tephrocotis** (Swainson, 1832) {near Carlton House, Saskatchewan}. Gray-crowned Rosy-Finch. Small; crown gray, cheek brown; includes *irvingi* Feinstein, 1958 {Anaktuvuk Pass, Alaska}, following Browning (1990); Brooks Range.

*L. t. griseonucha** (Brandt, 1842) {Aleutian Islands, Alaska}. Large; crown and cheek gray; browner than *umbrina*. Includes *griseogenys* Gould, 1843 {no type locality given}, *speciosa* (Finsch, 1872) {Unalaska Island, Aleutians}, *kadiaka* McGregor, 1901 {Kodiak Island, Alaska}, and *maxima* W. S. Brooks, 1915 {Copper Island, Commander Islands}, according to Hellmayr (1938). Aleutians, western Alaska Peninsula, Shumagin and Semidi islands; winters to Kodiak Island.

*L. t. littoralis** Baird, 1869 {Sitka, Alaska, and Port Simpson, British Columbia; the type is from Port Simpson (Hellmayr 1938)}. Small; both crown and cheek are gray, as in *griseonucha*; breeds C, SC, and SE Alaska.

*L. t. umbrina** Murie, 1944 {St. Paul Island, Pribilofs}. Large; blacker than *griseonucha*; breeds Pribilofs and St. Matthew and Hall islands.

*Pinicola enucleator leucurus** (P. L. S. Müller, 1776) {Canada; restricted to "city of Quebec, a place where it undoubtedly occurs at least in winter" (Oberholser 1914:52)}. Pine Grosbeak. The largest subspecies; includes *alascensis* Ridgway, 1898 {Nushagak, Alaska}, following Adkisson (1977); resident of the Alaska taiga.

*P. e. flammula** Homeyer, 1880 {"Nordwestamerika" = Kodiak Island, Alaska}. Averages shorter tailed and slightly smaller than *leucurus* and has more massive and more strongly hooked beak; *kodiaka* Ridgway, 1887 {Kodiak Island, Alaska} is a synonym; Alaska Pacific coast from Shumagin Islands, Alaska Peninsula, and Kodiak archipelago east to SE Alaska. Following the International Commission on Zoological Nomenclature (1985, Art. 31b [i]), we treat *kodiaka*, in juxtaposition with the masculine genus *Pinicola* (ICZN 1985, Art. 30a [i]), as a noun in apposition. Ridgway (1898) described the larger, taiga Pine Grosbeak from Nushagak, at the perimeter of its range in SW Alaska. With more than one form

resident in Alaska, it seems wise to restrict the type locality of the coastal subspecies. Its vague original attribution to "Nordwestamerika" was narrowed to "Alaska" by AOU (1931:322), and we here restrict the type locality of *flammula* to Kodiak Island.

*P. e. kamtschatkensis** (Dybowski, 1883) {Kamchatka}. Distinctly smaller than preceding subspecies, with narrower, blunt, strongly hooked bill; casual visitant in Aleutian and Pribilof islands, whence there are three specimens (*USNM, 2*; *UAM, 1*—see Riley 1917, Kenyon and Phillips 1965).

*P. e. carlottae** A. Brooks, 1922 {Graham Island, Queen Charlotte Islands, British Columbia}. Smallest and darkest. One specimen (*UAM 6758*): Ketchikan, 20 October 1995, R. Schuerger.

*Carpodacus erythrinus grebnitskii** Stejneger, 1885 {Petropavlovsk, Kamchatka}. Common Rosefinch. Two *UAM* specimens (see Dau and Gibson 1974).

*Carpodacus purpureus purpureus** (Gmelin, 1789) {South Carolina}. Purple Finch. Includes *taverneri* Rand, 1946 {Wood Buffalo Park, Alberta}, following Howell et al. (in Paynter 1968). Seven *UAM* specimens (see Gibson and Kessel 1992).

Carpodacus cassinii Baird, 1854 {Yavapai County, Arizona}. Cassin's Finch. Multiple records (no specimen; UAM photos)—Gibson and Kessel (1992).

*Carpodacus mexicanus frontalis** (Say, 1823) {near Colorado Springs, Colorado}. House Finch. One specimen (*UAM 6934*): Hyder, 1–2 June 1996, T. J. Doyle.

*Loxia curvirostra minor** (C. L. Brehm, 1846) {eastern United States = Black River, Michigan (Payne 1987)}. Red Crossbill. Includes *sitkensis* Grinnell, 1909 {Admiralty Island, Alaska}, following Dickerman (1987), Payne (1987), and Groth (1993). The irregularly numerous small-bodied and small-billed Red Crossbill that breeds in SE and SC Alaska.

*L. c. bendirei** Ridgway, 1884 {Fort Klamath, Oregon}. Moderately large. Two specimens (*MVZ 470–471*) from SE Alaska identified by A. R. Phillips (on specimen labels). The latter specimen was reported by Gabrielson and Lincoln (1959).

L. c. reai Monson and Phillips, 1981 {Shoshone County, Idaho}. Very small like *minor* but often with heavier bill. "Duller below and on crown and back than *minor*, the back less reddish (male) and thus more strongly contrasted (at least to rump); female also very dark- and dull-backed, in strong contrast to the rich-yellow rump, and more deep-ochraceous below" (Monson and Phillips 1981:228). Provisionally accepted by Browning (1990); maintained as a synonym of *minor* by Payne (1987) and Groth (1993). A red male from SE Alaska (USNM 239942, St. Lazaria Island, 11 August 1912, G. Willett) was identified by Phillips (op. cit.).

*Loxia leucoptera leucoptera** Gmelin, 1789 {Hudson Bay and New York}. White-winged Crossbill.

*Carduelis flammea flammea** (Linnaeus, 1758) {Norrland, Sweden}. Common Redpoll. Includes *holboellii* (C. L. Brehm, 1831) {Roda Valley, Thuringia}, following Vaurie (1956, 1959), Howell et al. (in Paynter 1968), Knox (1988a), and Cramp and Perrins (1994).

*Carduelis hornemanni hornemanni** (Holböll, 1843) {northern Greenland}. Hoary Redpoll. Larger and much paler than *exilipes*. One record (*UAM 2389*): Fairbanks, 28 March 1964—Kessel and Springer (1966).

*C. h. exilipes** (Coues, 1862) {Fort Simpson, Northwest Territories}. Smaller and not so pale as nominate *hornemanni*; the Alaska-breeding subspecies. In recent studies in Alaska, Troy (1980, 1985) concluded that *exilipes* comprises the lighter color variations within individual populations of *C. flammea* and, stating that *exilipes* and *flammea* represent the ends of a continuum of plumage and skeletal variability, recommended that all redpolls be considered a single species. Knox (1988a) examined museum specimens from throughout the range of the birds and concluded instead that apparent intermediate specimens are "an artefact of over-narrow definition of specific characters" (ibid.:22), not hybrids, and represent variability within two species. And Seutin et al. (1992, 1993) concluded from their

morphometric and plumage-variability studies in Manitoba that redpolls there represent the sympatric occurrence of two genetically determined phenotypic forms, i.e., two species. We continue to maintain two species of redpolls and to maintain *exilipes* in *C. hornemanni*.

Carduelis spinus (Linnaeus, 1758) {Sweden}. Eurasian Siskin. One specimen (*UAM 6354*): Attu Island, Aleutians, 21–22 May 1993, M. E. Isleib.

Carduelis pinus pinus (Wilson, 1810) {Philadelphia, Pennsylvania}. Pine Siskin.

Carduelis tristis [*jewetti* (van Rossem, 1943) {Ashland, Oregon} or *pallida* (Mearns, 1890) {Yavapai County, Arizona}]. American Goldfinch. Multiple records (no specimen; UAM photos)—see Gibson and Kessel (1992).

*Carduelis sinica kawarahiba** (Temminck, 1835) {Japan}. Oriental Greenfinch. Two *UAM* specimens (Gibson 1981).

*Pyrrhula pyrrhula cassinii** Baird, 1869 {Nulato, Alaska}. Eurasian Bullfinch. Seven specimens (*CAS, 3*; *UAM, 2*; *USNM, 2*—Baird 1869, Swarth 1928, Friedmann 1937, Kessel and Gibson 1978).

*Coccothraustes vespertinus brooksi** (Grinnell, 1917) {Okanagan, British Columbia}. Evening Grosbeak. Three *UAM* specimens (see Kessel and Gibson 1978).

*Coccothraustes coccothraustes japonicus** Temminck and Schlegel, 1848 {Japan}. Hawfinch. Four specimens (*UAM, 3*; *USNM, 1*—see Evermann 1913, Byrd et al. 1974); three are *japonicus*, and the other has been identified as intermediate between *japonicus* and widespread *C. c. coccothraustes* (Linnaeus, 1758) {Italy}.

PASSERIDAE

*Passer domesticus domesticus** (Linnaeus, 1758) {Sweden}. House Sparrow. Includes *plecticus* Oberholser, 1974 {Bonneville County, Idaho}, following Browning (1974). Two *UAM* specimens (see Gibson and Kessel 1992).

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THE BIRDS OF SAN PEDRO MÁRTIR ISLAND, GULF OF CALIFORNIA, MEXICO

BERNIE R. TERSHY and DAWN BREESE, Conservation International México, A. C., Sea of Cortez Ecosystem Program, Miramar, 63 Altos, Col. Miramar, Guaymas, Sonora, México 85455 (current address Island Conservation and Ecology Group, Institute of Marine Sciences, Earth and Marine Sciences Bldg., University of California, Santa Cruz, California 95064)

The islands in the Gulf of California may be the most ecologically intact nonpolar archipelago in the world. As such, they are of considerable importance to the scientific study of biogeography, community ecology, evolutionary biology, behavioral ecology, and other fields that depend on intact ecosystems. The spectacular beauty of these islands and the abundance of large charismatic animals (primarily marine mammals and seabirds) attract increasing numbers of ecotourists (Bourillón et al. 1994), and the high marine productivity around the islands attracts large numbers of commercial fishermen (Tershy et al. 1992). Despite the biological importance of these islands, the ease of accessibility, and the large number of visitors, "the island birds remain poorly known, with even species lists incomplete" (Cody 1983).

San Pedro Mártir Island (28° 23′ N; 112° 20′ W), covering 1.9 km^2, is precipitous and rocky, clothed with dense stands of dwarf cardón cactus (*Pachycereus pringlei*) and globe mallow (*Sphaeralcea hainesii*) on the upper slopes and a layer of white seabird guano on the lower slopes. It lies about 50 km from the coastlines of both Baja California and Sonora and about 43 km from the nearest island, San Esteban (see Tershy et al. 1992 for a detailed description). The most isolated island in the Gulf, it has a steep, rocky, nearly vertical shoreline and no sand beaches (Figure 1).

Previous published ornithological investigations of San Pedro Mártir Island have been based on short visits of one to several days. Goss (1888), Mailliard (1923), and Banks (1963) recorded some of the more conspicuous birds, and Cody (1983) published a more detailed list of birds, apparently based on several visits to the island. Van Rossem's (1945) review of the distribution of birds in Sonora included San Pedro Mártir. Velarde and Anderson (1994) reviewed the status of seabirds on all Gulf of California islands.

From 1990 to 1993 we lived on San Pedro Mártir Island over 13 months (20 March–4 August 1990; 13 February–3 July 1991; 19 January–15 May 1992; 4–14 Mar 1993) and attempted to identify to species all birds seen. Most of our time was spent on the lower slopes at the southeast end of the island where our field camp was located, but during our 1991 and 1992 field seasons we circumnavigated the island in sea kayaks at least once every two weeks. We did not hike to the top of the island or more than about 1 km from our field camp from mid February to early July, to avoid disturbing breeding Brown Pelicans (*Pelecanus occidentalis*) and boobies (*Sula nebouxii* and *S. leucogaster*) (Tershy et al. 1992).

In this paper we present an annotated species list for the resident and migrant birds of San Pedro Mártir Island. During our stays on the island we

recorded 82 species of birds: 8 species of breeding seabirds, 17 species of nonbreeding seabirds, 7 species of breeding or potentially breeding land birds, 11 species of visiting shorebirds and waders, and 39 species of visiting land birds. Cody (1983) recorded three species for San Pedro Mártir Island that we did not see, Say's Phoebe (*Sayornis saya*), Western Flycatcher (*Empidonax difficilis*), and Curve-billed Thrasher (*Toxostoma curvirostre*), bringing the total number of species recorded for San Pedro Mártir Island to 85. We recorded three breeding seabird species not reported for San Pedro Mártir Island by Velarde and Anderson (1994), Brandt's Cormorant (*Phalacrocorax penicillatus*), Heermann's Gull (*Larus heermanni*), and Craveri's Murrelet (*Synthliboramphus craveri*).

SPECIES ACCOUNTS

Common Loon (*Gavia immer*). Rare visitor to nearshore waters. One observation February 1992. Not previously reported for the waters around San Pedro Mártir Island, though the species winters regularly at least as far south as Colima (Howell and Webb 1995).

Pacific Loon (*Gavia pacifica*). Uncommon winter resident in nearshore waters. One seen June 1990 was outside dates from other years, which all fell between February and April. Not previously reported for the waters around San Pedro Mártir Island, though the species winters regularly throughout the Gulf of California (Howell and Webb 1995).

Figure 1. Aerial photograph of San Pedro Mártir Island showing the steep, relatively bare, guano-covered lower slopes of the island and the dense stands of dwarf cardón cactus and globe mallow on the upper slopes.

Western Grebe (*Aechmophorus occidentalis*). Rare visitor to nearshore waters. One observation February 1992. Not previously reported for the waters around San Pedro Mártir Island, though a regular winter visitor in Gulf of California (Wilbur 1987).

Eared Grebe (*Podiceps nigricollis*). Common winter resident. In 1990 seen only in April; in 1991 seen consistently February though May, in 1992 January through May, and in 1993 in March. The species' seasonal distribution was similar to that found 80 km to the NW in the Canal de Ballenas (Tershy and Breese 1993). Around San Pedro Mártir Eared Grebes were observed foraging in concentrations of the euphausiid *Nyctiphanes simplex* and perhaps of mysiid crustaceans. On 26 and 27 April 1991 a pure white individual was seen feeding with other Eared Grebes. It glowed underwater, and was usually at the edge of the group.

Sooty Shearwater (*Puffinus puffinus*). Rare summer visitor to nearshore waters. One observation June 1991. Not previously reported for the nearshore waters of San Pedro Mártir Island, but common in the central Gulf of California (Tershy et al. 1993, Howell and Webb 1995).

Black-vented Shearwater *(Puffinus opisthomelas)*. Rare visitor to nearshore waters. One sighting April 1991. Not previously reported for the nearshore waters of San Pedro Mártir Island, but common in the central Gulf of California (Tershy et al. 1993, Howell and Webb 1995).

Black Storm-Petrel (*Oceanodroma melania*). Uncommon visitor. Seen May, June, and July 1990; February, April, June 1991; March 1992 (flock of many hundreds; some Least Storm-Petrels may have been with this flock). Recorded on the island at night, but no evidence of nesting (although probably prospecting for sites when seen in caves 4 and 6 May 1990). Not previously reported for the nearshore waters of San Pedro Mártir Island; may have nested there prior to the introduction of rats (*Rattus rattus*) (Tershy et al. 1992). A large percentage of the world population breeds on Partida Island 80 km to the NW (Velarde and Anderson 1994).

Least Storm-Petrel (*Oceanodroma microsoma*) Rare visitor. One individual landed in camp the night of 17 June 1991. It may have been attracted to the bright lights of a ship night-fishing for bait. Not previously reported, but may have nested on the island prior to the introduction of rats (Tershy et al. 1992). A large percentage of the world population breeds on Partida Island 80 km to the NW (Velarde and Anderson 1994).

Red-billed Tropicbird (*Phaethon aethereus*). Resident breeder with an estimated 150 pairs. This was the rarest breeding seabird recorded in surveys of the Canal de Ballenas 80 km to the NW (Tershy et al. 1993). San Pedro Mártir has the only significant colony in the Gulf of California (Velarde and Anderson 1994). We found nests on all parts of the lower guano-covered slopes of the island, but most nests were concentrated under boulders on the north end. Breeding seemed to be spread out over much of the year with a possible peak in late winter. We estimated 500 birds in one circumnavigation of the island in March 1991, and our impression was that there may have been more than 150 nests. We collected regurgitations from two Red-billed Tropicbirds, containing a threadfin herring (*Opisthonema libertate*) and an unidentified squid.

Masked Booby (*Sula dactylatra*) Rare visitor. An adult with an orange bill was on the island for three weeks in April and May of 1992 (Figure 2). The orange-billed form *S. l. granti* breeds primarily on the Galapagos Islands. On islands closer to the Gulf of California (Clipperton, Rocas Alijos, and the Revillagigedos) the yellow-billed form *S. l. californica* predominates, and only a handful of orange-billed birds breed. This is, to our knowledge, the first record for the central Gulf of California (Grinnell 1928, Wilbur 1987, Howell and Webb 1995). We color-banded the Masked Booby orange over aluminum on the left tarsus.

Figure 2. Masked Booby on San Pedro Mártir Island April–May 1992, with cardón cactus in background.

Blue-footed Booby (*Sula nebouxii*) and Brown Booby (*S. leucogaster*). Resident breeders. These were the most abundant birds on the island with an estimated 110,000 and 74,000 pairs, respectively, in 1990 (Tershy et al. unpubl. data). San Pedro Mártir may support the largest Brown Booby colony in the world and the largest Blue-footed Booby colony outside Perú (Figures 3, 4).

Brandt's Cormorant (*Phalacrocorax penicillatus*). Breeder, nesting in three small colonies of about 20 to 60 pairs, one on the southernmost offshore rock, two on the cliffs on the north and northwest sides of the island. San Pedro Mártir Island appears to be the southernmost breeding colony of Brandt's Cormorants in the Gulf of California. Brandt's Cormorants bred earlier than boobies and the Brown Pelican, and most chicks fledged and dispersed away from the island by mid-March (1990) or early May (1991). Only a few birds attempted to nest during the 1992 El Niño, and, to our knowledge, none of them successfully fledged young. Not previously recorded breeding on San Pedro Mártir Island.

Double-crested Cormorant (*Phalacrocorax auritus*). Uncommon spring visitor. Recorded from 1990 to 1992 in April or May, occasionally roosting on coastal cliffs. Not previously reported for San Pedro Mártir Island, but a common resident in more coastal waters on both sides of the Gulf of California (Howell and Webb 1995).

Brown Pelican (*Pelecanus occidentalis*). Breeder, nesting within the cardón forest on the relatively flat upper part of the island, extending down onto the lower slopes in good years. On average about 2000–3000 pairs nest on the island (Velarde and Anderson 1994), but in the El Niño year of 1992 there were fewer than 100 active nests. They may begin breeding as early as December (D. Anderson pers. comm.) and, in 1990, most chicks had fledged by mid-June. By July, there were only a few individuals left on San Pedro Mártir Island.

Magnificent Frigatebird (*Fregata magnificens*). Common nonbreeding summer resident, with many hundred roosting on the cardón cactuses and fig trees (*Ficus palmeri*). There are probably a few individuals year-round on the island, but their numbers increase dramatically in the summer when more than 800 were seen roosting on cardón cacti at the southeast end of the island. For example, in 1991, the mean number of Magnificent Frigatebirds sighted per 10-day period increased from <15 from February through mid-April, to 20–150 in late April through early June, to 450 and 550 in the last 20 days of June.

Black-crowned Night Heron (*Nycticorax nycticorax*), Green Heron (*Butorides virescens*), Snowy Egret (*Egretta thula*), and Great Egret (*Ardea alba*). All rare visitors. Black-crowned Night Heron, Green Heron, and Great Egret seen once each in April of 1990, 1991, and 1992, respectively. Snowy Egret seen in April 1990 and May 1991. None of these species previously reported for San Pedro Mártir Island, though they breed commonly in coastal areas throughout México (Howell and Webb 1995).

Great Blue Heron (*Ardea herodias*). Uncommon visitor. Seen in every year, and at least once in all months but January and July. No previous records for San Pedro Mártir Island, but a common resident breeder throughout coastal areas of the Gulf of California (Howell and Webb 1995) and on several islands (pers. obs.).

American Oystercatcher (*Haematopus palliatus*). Common visitor. Recorded in April of 1990 and 1991, January and March through May in 1992. No previous records for San Pedro Mártir Island, but a common breeder throughout the Gulf of California, including many islands (Howell and Webb 1995).

Spotted Sandpiper (*Actitis macularia*) and Wandering Tattler (*Heteroscelus incanus*). Common winter residents. Both seen in all years with most sightings from

Figure 3. Nesting Blue-footed Booby at the edge of the cardón cactus and globe mallow stands.

Figure 4. Female Brown Booby with chick on the bare guano-covered lower slopes. Note the steep terrain, typical of San Pedro Mártir Island.

January through May, but some sightings in June. One sighting of a Wandering Tattler in July of 1992. Not previously recorded for San Pedro Mártir Island, but common along coast of Gulf of California, including many islands (Howell and Webb 1995, pers. obs.).

Red-necked Phalarope (*Phalaropus lobatus*). Rare visitor to nearshore waters, seen in May 1992. No previous records for San Pedro Mártir Island, but seasonally one of the most abundant seabirds in the central Gulf of California (Tershy et al. 1993).

Black Turnstone (*Arenaria melanocephala*), and Surfbird (*Aphriza virgata*). Uncommon visitors. Black Turnstone seen in March and April of 1991 and 1992, respectively. Surfbird seen only in March of 1991 and 1992. Neither previously recorded from San Pedro Mártir Island, though common winter residents along the coasts of the Gulf of California (Howell and Webb 1995).

Pomarine Jaeger (*Stercorarius pomarinus*). Rare visitor to nearshore waters, seen only in June 1991 and March 1992. Not previously recorded from nearshore waters of San Pedro Mártir but occurs regularly in the central Gulf of California (Howell and Webb 1995, Tershy et al. 1993).

Heermann's Gull (*Larus heermanni*). Breeder, with an estimated 120 pairs. This is the most abundant gull in the Gulf of California. More than 95% of the world population breeds on tiny Rasa Island (Velarde and Anderson 1994), and several

smaller colonies are established on other islands in northwestern México. On San Pedro Mártir Island there are two small colonies located near the northeastern and southwestern cobble bars. From a kayak we counted at the northeastern colony 97 nests (probably over 90% of the total) in 1991, 75 nests in 1992. The number of nests at the southwestern colony was considerably less (about 5 nests in 1991 and 1992). Heermann's Gulls breed between late February and early July, after which much of the population migrates to the Pacific coast (Velarde 1989). Not previously recorded breeding on San Pedro Mártir Island.

Yellow-footed Gull (*Larus livens*). Resident breeder, with an estimated 500 pairs. Possibly the Gulf of California's only endemic seabird, nesting along the shorelines of many islands in isolated pairs or small colonies (Spear and Anderson 1989). On San Pedro Mártir Island the nests are scattered along the entire shoreline. We used kayaks to circumnavigate the island and census Yellow-footed Gulls, counting 650 individuals on 30 April 1991 and 614 on 29 March 1992 (perhaps one-half to two-thirds of the population). In late March of both 1991 and 1992 the earliest nests had eggs. Yellow-footed Gulls are vulnerable to inadvertent disturbance by people landing on islands, often resulting in the loss of eggs or chicks and even total reproductive failure (Spear and Anderson 1989). Adults are easily scared off their nests, and because the eggs and chicks are cryptic in coloration, even experienced biologists can stumble into the middle of a small colony without realizing it. Egging and unintentional disturbance by commercial fishermen camping on the island may have decreased the fledging success of both Yellow-footed and Heermann's Gulls in some years (Tershy et al. 1992).

Bonaparte's Gull (*Larus philadelphia*). Uncommon visitor to nearshore waters. Seen only in April 1991 and March 1992. Not previously recorded from nearshore waters of San Pedro Mártir Island, but common in winter and early spring throughout the Gulf of California (Tershy et al. 1993, Howell and Webb 1995).

Ring-billed Gull (*Larus delawarensis*) and California Gull (*L. californicus*). Both common winter visitors to nearshore waters. Seen January–March of some years, with the Ring-billed Gull being slightly more abundant. Not previously recorded from nearshore waters of San Pedro Mártir Island. Both species are common winter residents in eastern Gulf of California but rare in the Canal de Ballenas in the western Gulf (Tershy et al. 1993).

Elegant Tern (*Sterna elegans*). Uncommon visitor. Seen in nearshore waters in March, June, and July 1990, and April through June 1992. Not previously recorded for the nearshore waters of San Pedro Mártir Island, but most of world population breeds on Rasa Island, 80 km to the NW (Velarde and Anderson 1994).

Royal Tern (*Sterna maxima*). Uncommon visitor. Seen near shore in July 1990 and June 1992. These may have been postbreeding dispersers from Rasa Island, where there is a large breeding colony (Velarde and Anderson 1994). Not previous reported from San Pedro Mártir Island's nearshore waters.

Craveri's Murrelet (*Synthliboramphus craveri*). Breeder, with one pair on one of the offshore rocks in 1991 (Breese et al. 1993) and 1993 but not during the 1992 El Niño. We spent hours thoroughly checking every possible nesting site on the two offshore rocks and are confident that there was only one nest. The murrelets may be excluded from the main island by roof rats, which were probably introduced at the turn of the century and prey on the adults, chicks, and eggs of small burrow-nesting seabirds (Velarde and Anderson 1994). Not previously recorded breeding on San Pedro Mártir Island.

Red-tailed Hawk (*Buteo jamaicensis*). Rare visitor. One seen in February 1992. Not previously recorded from the island but common in Baja California and Sonora (Howell and Webb 1995).

Osprey (*Pandion haliaetus*). Rare visitor. Seen from March through June 1991 and March through May 1992. Common resident on adjacent coasts of Baja California and Sonora as well as on many islands. Probably does not frequent San Pedro Mártir because of the lack of shallow water (Cody 1983). Not previously recorded from San Pedro Mártir Island.

American Kestrel (*Falco sparverius*). Unconfirmed breeder. Only one pair.

Peregrine Falcon (*Falco peregrinus*). Breeder, with one pair. It feeds on migrating seabirds, shorebirds, ducks, and land birds. We sampled the diet of one or more of the Peregrine Falcons on the island by collecting feathers at the base of a feeding perch (26 Feb, 5 Mar, 15 May, and 25 May 1991; 21 Apr, and 11 May 1992). We recorded feathers of the Black and Least Storm-Petrels, Blue-winged or Cinnamon Teal (*Anas discors* or *A. cyanoptera*), Spotted Sandpiper, Red-necked Phalarope, Bonaparte's Gull, American Kestrel, Mourning Dove, White-winged Dove, Allen's or Rufous Hummingbird, Belted Kingfisher, Rock Wren, Northern Mockingbird, Orange-crowned Warbler, and possibly a Western Tanager (see text for scientific names not listed here).

Mourning Dove (*Zenaida macroura*). Possible breeder. Seen regularly from March through June 1991 and March through April 1992.

White-winged Dove (*Zenaida asiatica*). Rare visitor. Seen only in April 1992. Not previously reported for San Pedro Mártir, but common in Sonora (Howell and Webb 1995).

Great Horned Owl (*Bubo virginianus*) and Burrowing Owl (*Speotyto cunicularia*). Rare visitors. Seen only in May 1990 and March 1992, respectively.

Lesser Nighthawk (*Chordeiles acutipennis*) and White-throated Swift (*Aeronautes saxatalis*). Rare visitors. Seen in March 1992 and June 1990, respectively. Not previously recorded from San Pedro Mártir Island, but common in northwestern México (Howell and Webb 1995).

Costa's Hummingbird (*Calypte costae*) and Anna's Hummingbird (*C. anna*). Rare visitors. Seen in May and March 1991, respectively. Anna's Hummingbird not previously recorded from San Pedro Mártir Island.

Rufous Hummingbird (*Selasphorus rufus*). Common visitor. Not previously recorded from the island. Positively identified only in May and Jun 1991. However, *Selasphorus* hummingbirds that could not be positively identified were seen from January through April in either 1991 or 1992. Hummingbirds that could not be identified to genus were seen in every month and in all years.

Belted Kingfisher (*Megaceryle alcyon*). Common resident. Seen in all months and in all years, but apparently suitable nesting substrate is lacking. Not previously recorded from San Pedro Mártir Island though common in Baja California and Sonora (Howell and Webb 1995).

Tropical Kingbird (*Tyrannus melancholicus*). Rare visitor. One seen in April 1991. Distinguished from Western (*T. verticalis*) and Cassin's (*T. vociferans*) Kingbirds by longer, heavier bill. Not previously recorded from San Pedro Mártir Island.

Black Phoebe (*Sayornis nigricans*). Rare visitor. One seen in March 1991. Not previously recorded from the island.

Say's Phoebe (*Sayornis saya*) and Western Flycatcher (*Empidonax difficilis*). Recorded by Cody (1983) but not by us.

Violet-green Swallow (*Tachycineta thalassina*), Barn Swallow (*Hirundo rustica*), and Purple Martin (*Progne subis*). Rare visitors. All sightings in spring, except for one

sighting of a Barn Swallow in June 1990. None of these Hirundinidae previously reported from San Pedro Mártir Island, and apparently no published records of the Violet-green Swallow for any Gulf of California island.

Common Raven (*Corvus corax*). Breeding resident. This is the most conspicuous of the island's breeding land birds. There are about 50 ravens on San Pedro Mártir (not all of which are breeding adults). Their diet is probably quite varied, but during the first part of the seabird nesting season they were observed feeding frequently on seabird eggs and chicks, and on fish scraps dropped in the seabird colony. In the late summer they were frequently seen feeding on cardón fruits, and we saw them feeding on carrion whenever it was available. Raven pellets we examined invariably contain parts of an undescribed trojine scarab beetle found on the island.

Rock Wren (*Salpinctes obsoletus*). Breeding resident. This is probably the most abundant land bird on the island (at least in some years). In late winter and early spring, especially after a year of heavy rainfall, Rock Wrens can be seen defending territories and foraging throughout the relatively barren lower slopes of the island.

Hermit Thrush (*Catharus guttatus*). Rare visitor, seen only in April 1991 and 1992. First records for San Pedro Mártir Island.

Loggerhead Shrike (*Lanius ludovicianus*). Rare visitor, seen only in April 1991 and April and May 1992. First records for San Pedro Mártir Island.

Northern Mockingbird (*Mimus polyglottos*). Uncommon visitor, seen only in February and May 1991.

Curve-billed Thrasher (*Toxostoma curvirostre*). Reported by Cody (1983) but not seen during this study.

American Pipit (*Anthus rubescens*). Rare visitor, seen only in March 1991 and April 1992. First record for San Pedro Mártir Island.

Orange-crowned Warbler (*Vermivora celata*). Common visitor, seen February and April 1991, March and April 1992. Not previously recorded for San Pedro Mártir Island.

Yellow-rumped Warbler (*Dendroica coronata*). Common visitor, seen February through May 1991 and April 1992.

Townsend's Warbler (*Dendroica townsendi*) and Yellow Warbler (*Dendroica petechia*). Rare and common visitor, respectively. Seen only in May and April, respectively. No published records of either species from a Gulf of California Island.

Wilson's Warbler (*Wilsonia pusilla*). Rare visitor. One sighting in April 1991. First record for San Pedro Mártir Island.

Common Yellowthroat (*Geothlypis trichas*). Uncommon visitor, seen in May 1990 and April 1991–1992. Not previously reported from San Pedro Mártir Island.

Savannah Sparrow (*Passerculus sandwichensis*) and Lark Sparrow (*Chondestes grammacus*). Rare and uncommon spring visitor, respectively. Neither previously reported for San Pedro Mártir Island.

Black-throated Sparrow (*Amphispiza bilineata*). Possible breeder. Seen only in February and March 1992, but observed singing. Not previously reported for San Pedro Mártir Island.

Clay-colored Sparrow (*Spizella pallida*). Common visitor, seen in February and March 1991 and not previously reported for any Gulf of California island.

Brewer's Sparrow (*Spizella breweri*). Common visitor, seen from February through May 1991 and in February of 1992.

Black-chinned Sparrow (*Spizella atrogularis*). Rare visitor. One seen in March 1992. First record for San Pedro Mártir Island.

White-crowned Sparrow (*Zonotrichia leucophrys*). Uncommon visitor, seen in spring 1991 and 1992.

Lincoln's Sparrow (*Melospiza lincolnii*). Rare visitor. One seen in March 1992.

Brown-headed Cowbird (*Molothrus ater*). Common visitor, seen in April and May 1991 and 1992. Not previously recorded for San Pedro Mártir Island.

Great-tailed Grackle (*Quiscalus mexicanus*). Rare visitor. One individual was a mascot on a commercial fishing ship that came from Topolobampo, Sinaloa. It left the ship and stayed on the island, where it was observed feeding on the endemic side-blotched lizard (*Uta palmeri*).

Streak-backed Oriole (*Icterus pustulatus*). Rare visitor. Three sightings of an immature male, probably the same individual, in April 1992. Distinguished by clear streaks on upper back. New record for a Gulf of California island.

House Sparrow (*Passer domesticus*). Common visitor. Seen in April 1990 and February through June 1991. Not previously reported from San Pedro Mártir Island. House Sparrows were seen only in the immediate vicinity of our research camp.

Lesser Goldfinch (*Carduelis psaltria*). Rare visitor. One seen in May 1992. Not previously reported for San Pedro Mártir Island.

House Finch (*Carpodacus mexicanus*). Possible breeder. Recorded breeding by Goss (1888). Seen by us from April through June 1991, but no nests found.

SUMMARY

On San Pedro Mártir Island in the central Gulf of California, 13 months of study distributed over three years revealed 82 species of birds. Of these, 8 are breeding seabirds (Red-billed Tropicbird, Blue-footed and Brown Boobies, Brown Pelican, Brandt's Cormorant, Heermann's and Yellow-footed Gulls, and Craveri's Murrelet), 7 breeding or probably breeding land birds (American Kestrel, Peregrine Falcon, Mourning Dove, Common Raven, Rock Wren, Black-throated Sparrow, and House Finch), and the remainder nonbreeding visitors. The booby colonies, numbering in the tens of thousands of each species, are among the largest in the world for each species. The populations of the tropicbird, pelican, and Yellow-footed Gull are of regional importance.

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NOTES

FOUR YOUNG FLEDGED BY A PAIR OF CALIFORNIA SPOTTED OWLS

WILLIAM S. LAHAYE, P. O. Box 523, Big Bear City, California 92314

The Spotted Owl (*Strix occidentalis*) has been studied extensively for the past two decades (Gutiérrez et al. 1995). Two of the key life-history parameters estimated from this research have been clutch and brood size. In the Spotted Owl, broods of one and two are common, while broods of three are rare, and no broods of four have been reported since the turn of the century (Gutiérrez et al. 1995). The only brood of four recorded in the literature was noted by Bendire (1892), who recounted a letter he received describing a Spotted Owl nest with four young, located in southern Arizona. The only four-egg clutch reported in the literature was from Orange County, California (Dunn 1901). A four-egg clutch supposedly of the Spotted Owl, housed at the Western Foundation of Vertebrate Zoology, was collected by Colonel Joseph Hamilton in 1889 from Los Angeles County, California. Measurement of these eggs, however, revealed that they were too large to have been laid by a Spotted Owl and were most likely those of a Great Horned Owl (R. J. Gutiérrez pers. comm.).

The Spotted Owl is a relatively long-lived species with very low reproductive potential (Gutiérrez et al. 1995). Each year, typically about 60% of the pairs attempt to nest and only 50% successfully fledge young (Gutiérrez et al. 1995). Over 95% of the broods are composed of either one or two owlets (Gutiérrez et al. 1995). Thus, information on variation in brood size is important to document. Here I describe a brood of four fledglings near Lake Arrowhead in the San Bernardino Mountains of California.

Research on the demography of the Spotted Owl in the San Bernardino Mountains began in 1987, one of three studies of the demography of the Spotted Owl in California overseen by Humboldt State University. The primary purpose of this research was to estimate a number of the Spotted Owl's demographic parameters, including territory-occupancy rates, sex- and age-based survivorship, and reproduction (LaHaye et al. 1994). We have also addressed a number of other issues including home range size, habitat use, and diet (Verner et al. 1992).

As part of this study, owl reproduction was checked annually by the methods of Forsman (1983) and Franklin et al. (1996). On 26 May 1994 we located a pair of owls with three fledged young and a fourth owlet still in the nest tree. On 17 June 1994, all four fledglings were banded approximately 100 meters east of the nest tree.

This pair formed in 1993 and did not fledge young that year. The following three years, however, they successfully fledged young, four in 1994, one in 1995, and two in 1996.

In 1994 Spotted Owl reproduction was above average in the San Bernardino Mountains. The number of young fledged per pair (0.85) was the highest estimate recorded during the ten years (1987–1996) of this study. Wagner et al. (1996) and Zabel et al. (1996) found a negative correlation between Spotted Owl reproduction and the current winter's rainfall. This relationship did not exist in the San Bernardino Mountains. However, LaHaye et al. (1994) found a positive relationship between Spotted Owl reproduction and the previous winter's rainfall.

In the last 20 years of intensive research on this species, this was the only one of 2592 (0.03%) Spotted Owl broods observed that contained four owlets (Gutiérrez et al. 1995). I suspect that the estimate of rarity of Spotted Owl broods of four generated

from data collected in the last two decades is more reliable than estimates generated from the scant data available prior to the mid 1970s. In either case, broods of four are rare for this species.

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NESTING SUCCESS OF THE WESTERN WOOD-PEWEE IN COLORADO

JAMESON F. CHACE, ALEXANDER CRUZ, and ALEXANDER CRUZ, JR., Department of Environmental, Population, and Organismic Biology, University of Colorado, Boulder, Colorado 80309-0334

Although the Western Wood-Pewee (*Contopus sordidulus*) has a large western North American breeding distribution, little is known about its reproductive biology (Bent 1942, Murphy 1983, Curson 1996). Here we provide information on the nest-site characteristics and nesting success of the Western Wood-Pewee in the forests of Ponderosa Pine (*Pinus ponderosa*) in the foothills of Colorado.

We located 26 Western Wood-Pewee nests in the Ponderosa Pines and adjacent riparian corridors (Box Elder, *Acer negundo*; willow, *Salix* sp.; cottonwood, *Populus* sp.) of Boulder County, Colorado (elevation 1550 to 2150 m, 40° 00' N, 105° 20' W), in 1990 (n = 15) and 1992 (n = 11). Nests were found during different stages of reproduction, and we observed them every three to five days until the nest was successful or failed. We observed nests directly or by mirror-pole, recorded their contents, and determined causes of nest failure. By examining nest contents and condition, we categorized the causes of nest failure as predation, parasitism, weather, or unknown. We used the Mayfield method (Mayfield 1961, 1975) to determine nesting success. The Mayfield method provides a standardized measure of nest success, by taking into account the number of days of exposure, that is comparable to other studies of nesting success. We measured nest height, nest distance to trunk, and nest distance to the outer edge of foliage.

Most pewee nests were successful in fledging at least one young (1990, 83.3%, n = 12; 1992, 80%, n = 10; combined, 81.8%, n = 22). Three nests were preyed upon, and one nest was destroyed following a severe hail storm. All nests observed from incubation (n = 9) had a clutch of three eggs and a hatching success of 81.5%. There was a mean of 2.76 [standard error (SE) ± 0.09, n = 21] nestlings and 2.66 (SE 0.11, n = 18) fledglings per nest. Fledging success per egg laid (n = 27) was 76.2% and per nestling (n = 58) was 82.7%. The probability of a pewee egg surviving to hatch (16 days) was 0.89; of a nestling surviving to fledge (14 days) 0.76. Using the Mayfield method we calculated a pewee nest to have a 66.4% chance of surviving 30 days of exposure, at a mortality rate of 0.013 per day, to fledge at least one young.

Most of the 26 nests were located in Ponderosa Pines (84.6%); three nests were in Narrow-leaf Cottonwood (*Populus augustifolia*), one in a willow tree. Nests were typically built in the upper half of the tree (mean nest height, 7.20 m ± SE 0.78 m) and were located on a medium-sized branch usually closer to the outer edge of the foliage (distance to foliage, 1.33 ± 0.15 m) than to the trunk (distance to trunk, 2.05 ± 0.21 m).

Nest height of Western Wood-Pewees in this study is similar to the nest height of those in Arizona [78% (n = 9) mean height > 9.1 m], but higher than nests in California pines (3 of 4 nests at 2.4 m) found by Harrison (1979). The Western Wood-Pewee's nest placement is similar to that of many other tree-nesting tyrant flycatchers in North America that have a mean nest height greater than 2.0 m above the ground (Murphy 1983). Nests of the Western Wood-Pewee, Eastern Wood-Pewee (*C. virens*), and kingbirds are typically placed closer to the foliage than to the trunk, which has been shown to be an important strategy in reducing nest failure in the Eastern Kingbird (*Tyrannus tyrannus*) (Murphy 1983).

Success of the Western Wood-Pewee nests in this study was higher than that found for other tyrannid flycatchers (Murphy 1983, Klaas 1993, Sedgwick 1993). The mortality per day (1.3%) of the Western Wood-Pewee is similar to that of other

tyrannids reviewed by Murphy (1983), so the higher success of pewees may be due, in part, to the pewee's total nesting period (incubation and nestling) being shorter than those of the Eastern, Western (*T. verticalis*), and Cassin's (*T. vociferans*) Kingbirds (32–36 nest days; Ehrlich et al. 1988). Pewees have a higher probability of nest success than nonparasitized Eastern Phoebes (*Sayornis phoebe*) (66.4% versus 43.0–61.0%; Klaas 1993). Within the same habitat, Western Wood-Pewees had a significantly higher nesting success ($G = 6.8326$, df = 1, $p < 0.05$) than Solitary Vireos (*Vireo solitarius*). The probability of a vireo egg surviving to hatch (14 days) was 0.55; of a nestling surviving to fledge (16 days) 0.43, with a mortality rate of 4.3% per day (Chace 1995).

The frequency of predation on Western Wood-Pewee nests was much lower than that of other species building open-cup nests in the Ponderosa Pine forest of Boulder County. Pewee nests were preyed upon (13.6%) much less frequently than were Solitary Vireo nests in the same area (49.4 %, n= 81, 1993–1994, Chace 1995). Potential nest predators include the Steller's Jay (*Cyanocitta stelleri*), Blue Jay (*C. cristata*), Black-billed Magpie (*Pica pica*), American Crow (*Corvus brachyrhynchos*), Common Raven (*C. corax*), Abert's Squirrel (*Sciurus aberti*), Least Chipmunk (*Eutamias minimus*), Colorado Chipmunk (*E. quadrivittatus*), and the Bull or Gopher Snake (*Pituophis melanoleucus*).

Brown-headed Cowbirds (*Molothrus ater*) did not successfully parasitize any of the 26 pewee nests, while within the same study area 47% (n = 132) of Solitary Vireo nests were parasitized in 1984, 1985, 1986, 1992, and 1993 (Chace et al. in press). Some tyrannids accept cowbird eggs and are parasitized frequently (e.g., the Willow Flycatcher, *Empidonax traillii*), while other species reject cowbird eggs (Eastern Kingbird) (Sedgwick and Knopf 1988, Sealy and Bazin 1995) The Western Wood-Pewee is not a frequent host of the cowbird (Friedmann 1971); however, without experimental evidence it is uncertain whether the pewees remove cowbird eggs, drive cowbirds from the nest site, or cowbirds do not choose pewee nests to parasitize.

The low rate of failure due to parasitism and predation in an area where such losses are common suggests that a combination of nest placement and nest defense may increase the nesting success of the Western Wood-Pewee. Briskie et al. (1990) found that parasitism decreased with increasing nest height, which could explain the greater nest success of high-nesting pewees over low-nesting Solitary Vireos (mean height 2.55 m ± SE 0.12, n = 81, Chace 1995). The adults' defense of the nest may contribute to the high nest success in this species. Tyrannids are well known for their aggressiveness (Bent 1942, MacKenzie and Sealy 1981). The Western Wood-Pewee has been observed to drive Steller's Jays from the nest area (Bent 1942, pers. obs.), and nest defense can reduce the frequency of cowbird parasitism (Briskie et al. 1990, but see Smith et al. 1984). We observed a Western Wood-Pewee successfully drive a female cowbird away from an active late-stage (day 14) nest. We observed that when we approached a nest the incubating adult would typically flush silently and perch a short distance away. Discovery of a pewee nest by a predator or cowbird may be difficult since the adults are secretive around the nest site (Uyehara and Narins 1995). However, aggression toward a potential nest predator or cowbird may be beneficial in situations where the intruder has detected the nest. A combination of nest placement and appropriate anti-predator/anti-cowbird behavior may increase the nesting success of Western Wood-Pewees over that of other passerines within the Ponderosa Pine forest.

We thank Philip Unitt and Julie Uyehara for their instructive comments on the manuscript. The City of Boulder Mountain Parks and Open Space and Boulder County Open Space granted us permission to conduct our studies, for which we are very grateful.

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Accepted 3 February 1997

NORTHERN GOSHAWK BREEDING RECORDS FROM SAN DIEGO COUNTY, CALIFORNIA

LLOYD F. KIFF, The Peregrine Fund, 566 West Flying Hawk Lane, Boise, Idaho 83709

DENNIS R. PAULSON, Slater Museum of Natural History, University of Puget Sound, Tacoma, Washington 98416

The egg collection at the Slater Museum of Natural History, University of Puget Sound, Tacoma, Washington, contains a set (PSM 13196) of three eggs of the Northern Goshawk (*Accipiter gentilis*) collected on 7 May 1937 at an elevation of 5000 ft in the Cuyamaca Mountains, San Diego County, California, by E. E. Sechrist. These specimens document a significant southerly extension of the known historical breeding range of this species along the Pacific Coast.

The eggs measure 57.47 × 45.25, 55.95 × 45.10, and 57.40 × 45.46 mm, are elliptical in shape (Preston in Palmer 1962), white with no superficial markings, and not glossy. In these details they agree with standard published descriptions of Northern Goshawk eggs, including the measurements given by Bent (1937), 59.3 (55–65.5) × 45.6 (43.2–50.1) mm; (n = 27), and Palmer (1988), 57.76 ± 2.05 × 44.73 ± 1.67 mm (n = 20). Sechrist's eggs do not overlap in size with those of the congeneric Cooper's Hawk (*A. cooperii*), the most likely species with which the goshawk could be confused in San Diego County. The sizes of Cooper's Hawk eggs are given by Bent (op. cit.) as 49 (43–54) × 38.5 (34–42) mm (n = 62), and Palmer (op. cit.), 48.17 ± 2.32 × 38.01 ± 1.47 mm (n = 21). Incubation of the clutch was reported as "heavy," and the eggs were prepared with unusually large blowholes (mean = 5.6 mm).

Sechrist noted on the back of the egg data card that he saw two young birds, presumably recent fledglings, at the same locality in June 1938. There is no apparent reason to doubt the authenticity of these records. Although he was an amateur naturalist, Sechrist was active in the Cooper Ornithological Society throughout his lifetime and was regarded by southern California ornithologists as a highly reliable egg collector thoroughly familiar with California birds (R. Quigley pers. comm.). Sechrist's collection was deposited at the San Bernardino County Museum, but it does not contain additional Northern Goshawk sets or additional notes on San Diego County goshawk records (R. McKernan pers. comm.). The Sechrist set came to the Slater Museum as a part of the collection of John B. Hurley, another highly reliable collector who was familiar with goshawk eggs.

Although there have been numerous summer observations of Northern Goshawks in southern California mountains over the years south to the San Jacinto Mountains, Riverside County (e.g., Garrett and Dunn 1981, McCaskie 1987, Lentz 1993), the southernmost confirmed breeding records are from northern Ventura County. Garrett and Dunn (op. cit.) reported a set of three Northern Goshawk eggs (Western Foundation of Vertebrate Zoology no. 45,214) taken at "San Jacinto" (= Mt. Pinos), Ventura County on 6 May 1904 by Elmer Bowen. More recently, two nests were found active at the same time (June 1989) on Mt. Abel and Mt. Pinos, Ventura County, respectively (McCaskie 1989), and the Mt. Abel nest was active again in the following year (McCaskie 1990, Lentz 1993). Although there have been a few subsequent summer records for this species in southern California mountain ranges, including the San Bernardino and San Jacinto Mountains, no other actual nests have been confirmed.

The only previously published San Diego County records of this species were of two birds collected during the nonbreeding season in November and January,

respectively (Unitt 1984), and one seen on Palomar Mountain on 22 March 1984 (McCaskie 1984).

We are grateful to Bob McKernan for checking (albeit unsuccessfully) the archives of the San Bernardino County Museum for Sechrist's field notes, Raymond Quigley for providing information on Sechrist, William Block and Philip Unitt for improving the manuscript, and René Corado of the Western Foundation of Vertebrate Zoology for other assistance.

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Accepted 3 February 1997

KILLDEER HATCHES IN A SNOWY PLOVER NEST

ANDREA AGEE, Don Edwards San Francisco Bay National Wildlife Refuge, P.O. Box 524, Newark, California, 94560 (current address 10117 Ranchwood Manor Dr., Oklahoma City, Oklahoma 73139)

On 10 June 1996, I discovered a Snowy Plover (*Charadrius alexandrinus*) nest on a salt pan at the Don Edwards San Francisco Bay National Wildlife Refuge, Fremont, California. The nest contained two Snowy Plover eggs and one egg that was significantly larger, slightly darker, and with wider markings. I later identified the latter as a Killdeer (*Charadrius vociferus*) egg. All three eggs were being incubated by a female Snowy Plover, and no adult Killdeer was observed nearby. On my next visit on the evening of 12 June, a newly hatched Killdeer chick, still damp with a solid dark brown downy covering, lay huddled in the nest. The two Snowy Plover eggs had not yet hatched. The following day refuge biologist Joy Albertson and I observed the nest from a road approximately 10 m away. At that time, the Killdeer chick was out of the nest, appeared healthy, and was running toward the female Snowy Plover, standing approximately 3 m distant. Since we did not want to keep the female away from the nest any longer than necessary, we did not approach the nest. On 14 June I approached the nest and observed one newly hatched plover chick and the shell fragments of the second Snowy Plover egg, which appeared to have hatched earlier. The adult female plover was nearby, but I did not see the killdeer chick or the other Snowy Plover chick, so assumed they were hidden in nearby vegetation. No adults or chicks were present when I returned to the area the following week.

This particular Snowy Plover nest was the only one I observed parasitized, although there were several other plover nests on the same salt pan. There are no records of such an incident occurring before on the refuge, and in further research I found no publications describing the parasitism of a Snowy Plover nest by a Killdeer.

Accepted 18 February 1997

Wing Your Way to . . .

Western Field Ornithologists'

22nd Annual Meeting

IMPERIAL VALLEY, CALIFORNIA

21–24 August 1997

at the Airporter Inn in Imperial, adjacent to the Imperial County airport, 3 miles north of El Centro, and near the south end of the Salton Sea.

Field trip destinations on Friday, Saturday, and Sunday mornings include many sites around the Salton Sea and throughout the Imperial Valley. Air-conditioned minivans will be available!

Target species include the Wood Stork, Fulvous Whistling Duck, Yellow-footed Gull, Laughing Gull, Gull-billed Tern, Black Skimmer, Stilt Sandpiper, and many others. The meeting takes place at the peak of waterbird migration, when tens of thousands of shorebirds, Black Terns, and more converge on the Salton Sea. Plus, the timing maximizes our chance of finding frigatebirds, boobies, or other wanderers for which the Salton Sea region is famed.

Because of the high summer temperatures in Imperial County, our field trips will take place in the morning only, and our meetings and scientific presentations will be spread over two afternoons and evenings, Friday and Saturday. In addition, Friday evening features a workshop on bird atlases and the notorious identification panel, Saturday our evening banquet.

Our scientific presentations will focus on the ornithology, biology, and conservation of the Salton Sea area and nearby desert regions. Several well-known field ornithologists have already committed to speak, but we welcome additional speakers. If you would like to present at the meeting, please contact Philip Unitt (San Diego Natural History Museum, P. O. Box 1390, San Diego, CA 92112) or Kimball Garrett (Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007).

Address for registration and correspondence concerning other aspects of the meeting: WFO conference, IVC Desert Museum, P. O. Box 430, Ocotillo, CA 92259.

WESTERN BIRDS

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Back issues of *Western Birds* within U.S.: $20 per volume, $5.00 for single issues, plus $1.00 for postage. Outside U.S.: $28 per volume, $7.00 for single issues.

The California Bird Records Committee of Western Field Ornithologists recently revised its 10-column Field List of California Birds (June 1996). The last list covered 578 accepted species; the new list covers 592 species. Please send orders to WFO, c/o Dori Myers, Treasurer, 6011 Saddletree Lane, Yorba Linda, CA 92886. California addresses please add 7.75% sales tax.

Quantity:

1-9, $1.50 each, includes shipping and handling. 10-39, $1.30 each, add $2.00 for shipping and handling. 40 or more, $1.15 each, add $4.00 for shipping and handling.

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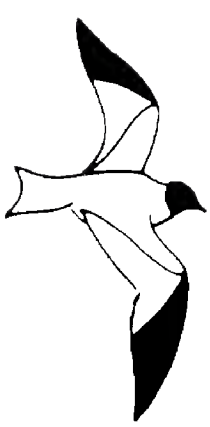

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Cover photo by © Brian E. Small of Los Angeles, California: Western Tanager *(Piranga ludoviciana)*, Chuckwalla Mountains, Riverside County, California, May, 1996.

Western Birds solicits papers that are both useful to and understandable by amateur field ornithologists and also contribute significantly to scientific literature. The journal welcomes contributions from both professionals and amateurs. Appropriate topics include distribution, migration, status, identification, geographic variation, conservation, behavior, ecology, population dynamics, habitat requirements, the effects of pollution, and techniques for censusing, sound recording, and photographing birds in the field. Papers of general interest will be considered regardless of their geographic origin, but particularly desired are reports of studies done in or bearing on the Rocky Mountain and Pacific states and provinces, including Alaska and Hawaii, western Texas, northwestern Mexico, and the northeastern Pacific Ocean.

Send manuscripts to Philip Unitt, San Diego Natural History Museum, P.O. Box 1390, San Diego, CA 92112. For matter of style consult the Suggestions to *Contributors to Western Birds* (8 pages available at no cost from the editor) and the *Council of Biology Editors Style Manual* (available for $24 from the Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, MD 20814).

Reprints can be ordered at author's expense from the Editor when proof is returned or earlier.

Good photographs of rare and unusual birds, unaccompanied by an article but with caption including species, date, locality and other pertinent information, are wanted for publication in Western Birds. Submit photos and captions to Photo Editor. Also needed are black and white pen and ink drawings of western birds. Please send these, with captions, to Graphics Manager.

WESTERN BIRDS

Volume 28, Number 3, 1997

TWENTIETH REPORT OF THE CALIFORNIA BIRD RECORDS COMMITTEE: 1994 RECORDS

STEVE N. G. HOWELL and PETER PYLE, Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, California 94970

This report covers 167 records of 75 species submitted by 158 observers to the California Bird Records Committee (hereafter the CBRC or the Committee). The 130 records accepted, of 57 species, represent an acceptance rate of 77.8%. They pertain to 24 counties, with most being from San Francisco (16 accepted records, all from SE Farallon I.), Los Angeles (15), Monterey (12), Marin (11), and Orange (11).

The records in this report span the period 1978–1995, with the great majority from 1994; records relating to 1995 refer to long-staying birds first found in 1994 or earlier. Three species (Light-mantled Sooty Albatross, Dark-rumped Petrel, Greater Shearwater) are added to the state list on the basis of well-documented records. Other highlights of 1994 include a Roseate Spoonbill, a Whooper Swan, a Little Curlew, two Red-necked Stints, an adult Sooty Tern, a Ruby-throated Hummingbird, a singing Eastern Wood-Pewee, a Louisiana Waterthrush, an overwintering adult male Mourning Warbler, and two Field Sparrows.

Committee News. At the January 1997 meeting in Camarillo, it was agreed that the Secretary need not necessarily be one of the ten voting members of the Committee and that the present roles of Secretary would be spread between a voting Chairperson, and a voting or nonvoting Secretary. Subsequently, Richard A. Erickson was elected Chairperson and David V. Blue was elected nonvoting Secretary.

The Committee's membership at the close of the 1997 meeting was Richard A. Erickson (Chairperson), Scott B. Terrill (Vice Chair), David V. Blue (nonvoting Secretary), Kimball L. Garrett, Steve N. G. Howell, Guy McCaskie, Joseph Morlan, Peter Pyle, Stephen C. Rottenborn, Mike San Miguel, and Daniel S. Singer.

Potential first-state records currently under review by the CBRC include the Shy Albatross (*Diomedea cauta*), Parkinson's Petrel (*Procellaria parkinsoni*), Great-winged Petrel (*Pterodroma macroptera*), Bulwer's Petrel

(*Bulweria bulwerii*), Black Vulture (*Coragyps atratus*), Crested Caracara (*Caracara plancus*), Common Ringed Plover (*Charadrius hiaticula*), Slaty-backed Gull (*Larus schistisagus*), Red-legged Kittiwake (*Rissa brevirostris*), Swallow-tailed Gull (*Creagrus furcatus*), White-winged Tern (*Chlidonias leucopterus*), Buff-collared Nightjar (*Caprimulgus ridgwayi*), Rose-throated Becard (*Pachyramphus aglaiae*) and Arctic Warbler (*Phylloscopus borealis*). Recently accepted first state records are of the Ivory Gull (*Pagophila eburnea*) and Lanceolated Warbler (*Locustella lanceolata*; Hickey et al. 1996), bringing the state list to 595 as of 18 January 1997.

CBRC Functions. All records reviewed by the CBRC (including copies of descriptions, photographs, videotapes, voice recordings, and Committee comments) are archived at the Western Foundation of Vertebrate Zoology, 439 Calle San Pablo, Camarillo, California 93012, and are available for public review. The CBRC solicits and encourages observers to submit documentation for all species on its Review List (see Roberson 1993), as well as species unrecorded in California. Please note that records formerly sent to Michael A. Patten should now be directed to David V. Blue, CBRC Secretary, 1013 Heritage Drive, Ridgecrest, CA 93555-5509.

Documentation/Descriptions. It should be noted that most records not accepted achieved this status not because the Committee felt a mistake had been made but rather because the documentation provided did not establish the identification beyond reasonable doubt. Many birders do not take field notes or look critically at birds they find, and many rely on cameras or other technology to fill in the gaps. But if that film is damaged or lost there is no documentation. We can only encourage observers to train their minds to describe what they see and to practice writing descriptions and making sketches (even simple or crude sketches can be most helpful). Consider writing notes and making sketches for a familiar and common bird like a House Sparrow (*Passer domesticus*). This species (it must have some use!) is a good subject for honing your observational skills, rather than trying to develop them only when confronted with a rarity.

Persons submitting photographs should send at least a cover sheet with the circumstances of the observation, weather conditions, distance from the bird, etc., as well as the date and location. Records consisting of a photograph *only* are not looked upon favorably by CBRC members, some of whom reject outright any such records! Therefore, if you take the time to send photos, the record will be enhanced greatly, to your credit and to everyone's benefit, by an accompanying written account (albeit brief) of the sighting.

Legible writing is also appreciated for any record submitted to the CBRC—at least one observer has not been credited in this report because we could not decipher his/her handwriting!

Seabird Documentation. Seabirds present a special situation deserving some comment. Erickson and Terrill (1996) noted briefly some problems associated with records of pelagic birds and here we discuss factors observers should consider when documenting their sightings. The problems of an unstable observation platform and, usually, briefer views of a bird than one might like, are compounded by the fact that most seabird rarities are unfamiliar to the majority of birders, who make at most one or two pelagic

trips a year. In such instances, photos can be a real boon in evaluating an identification. At the same time, critical written descriptions and sketches can also be very useful, perhaps providing important information that a photo may not show.

Certain basic details of a seabird observation should accompany any such record (photographic or sight). A simple sketch (Figure 1) can serve to convey much of the important information about the bird's flight path relative to your position, to the sun, and to the wind direction and strength. Flight paths A and B (Figure 1) clearly represent two very different observation scenarios, although a brief sentence summarizing the circumstances could make both sound the same: bird A is going in the direction opposite to

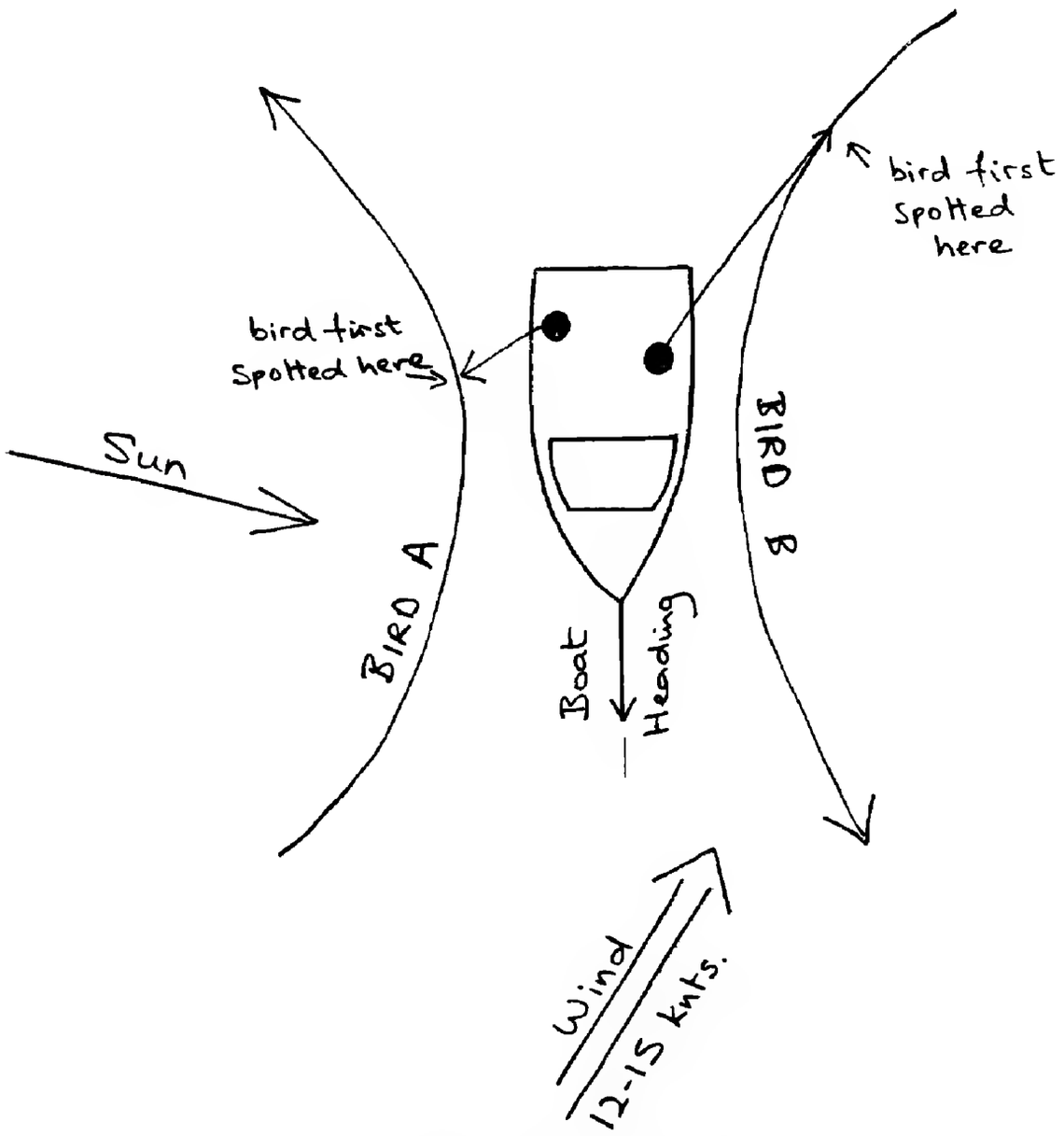

Figure 1. Diagramatic representation of a boat and its heading, observer positions on the boat, the sun's relative position (even if overcast), the direction and strength of the wind, and two birds' flight paths relative to an observer and the boat. These details should be noted in descriptions of seabirds.

the ship's, with the wind, and against the sun; bird B is going with the ship, against the wind, and in good light, and therefore could be watched for longer and in far better light than bird A.

Flight behavior, while often of help in identification, is primarily of use when synthesized with a number of variables and, like so many factors, depends greatly upon an observer's experience. Relying upon a single flight style, which may be touted as diagnostic by field guides, can lead to misidentifications. Flight manner may be broken into four broad categories that seabird researchers have recognized and used in data collection for many years (e.g., Spear and Ainley 1997a,b): direct flight (transiting or migration), non-directional flight ("milling"), feeding or foraging flight, and escape flight (in response to being disturbed by a boat or a predator, such as a jaeger). Each of these categories varies with wind strength, which can be calm (0–2 knots), light (3–9 knots), moderate (10–19 knots), or strong (20–30+ knots). Crudely, this can mean 4 flight manners × 4 wind speeds = 16 flight manners. In addition, a bird's flight direction relative to wind direction can also affect greatly its flight manner: the three main categories here are

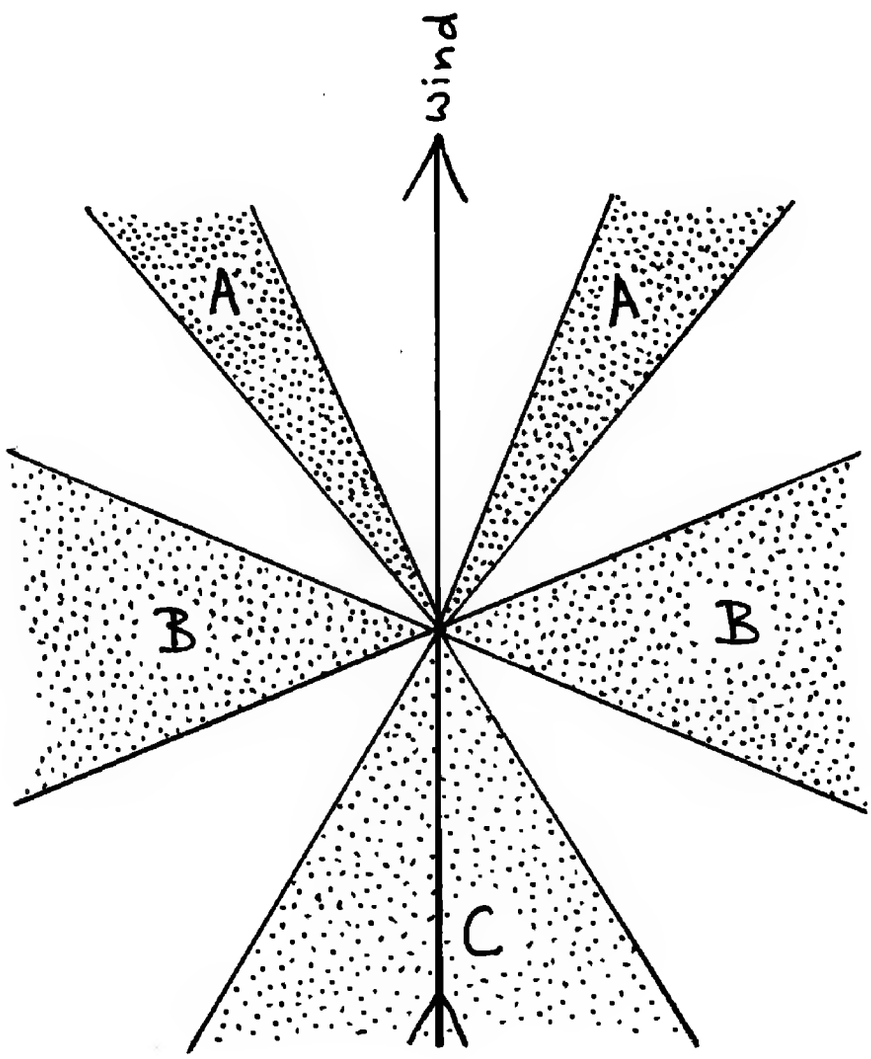

Figure 2. Bird flight paths relative to the wind: A, flying with the wind (rarely do birds fly with the wind directly astern); B, across the wind; C, into (or against) the wind.

into the wind, with the wind, and across the wind (Figure 2). Consequently, 16 × 3 gives a minimum of 48 potential flight styles for a single bird! Many seabird species show similar overall variations in flight manner.

For example, a Leach's Storm-Petrel (*Oceanodroma leucorhoa*) feeding into a light to moderate wind often beats its wings fairly steadily, then banks back into a glide with the wind before turning and beating into the wind again (much as a tern does over a lake). However, a Leach's Storm-Petrel transiting across or with a moderate to strong wind can travel by a progression of long, shearing glides interspersed with short bursts of brief flapping.

Although evaluating a bird's flight behavior often requires some comparative experience, noting its flight direction relative to the wind, and wind speed, is fairly straightforward. Another trick to practice is noting how a bird holds its wings, as viewed head-on, and through how much of an arc the wings are flapped, especially relative to a horizontal plane. Our intent is not to discourage observers from ever setting foot again on a ship (!) but to draw attention to many factors that should be considered in observing seabirds. As with describing and sketching a House Sparrow, you can practice with sketches of flight direction, wind speed, ship direction, etc., on those long stretches punctuated by little but Sooty Shearwaters (*Puffinus griseus*) or Black Storm-Petrels (*Oceanodroma melania*).

Format and Abbreviations: As in other recent CBRC reports, records are listed geographically, from north to south, and/or chronologically by first date of occurrence. Included with each record is the location, county abbreviation (see below), and date span. The date span usually follows that published in *National Audubon Society Field Notes* but, if the CBRC accepts a date span that differs from a published source, the differing dates are italicized. Initials of the observer(s) responsible for first identifying the bird (if known and if they have supplied documentation) are followed by a semicolon, then the initials of additional observers submitting documentation, then the CBRC record number. All records are sight records unless indicated otherwise: initials followed by a dagger (†) indicate the observer supplied an identifiable photograph; (‡) indicates videotape; (§) indicates a voice recording; and (#) indicates a specimen record, followed by the acronym (see below) for the institution housing the specimen and that institution's specimen number.

An asterisk (*) prior to a species' name indicates that the species is no longer on the CBRC Review List. The number in parentheses after the species' name is the number of records accepted by the CBRC through this report. Two asterisks (**) after the species' total indicate that the number of accepted records refers only to a restricted review period or includes records accepted for statistical purposes only—see Roberson (1986) for more information.

When individual birds return to a location after a lengthy or seasonal absence, each occurrence is reviewed under a separate record number, and the Committee members indicate whether or not they believe the bird is the same individual as one accepted previously. Such decisions follow the opinion of the majority of members and, if a bird is considered a returning individual, the total number of records remains unchanged.

Although the CBRC does not formally review the age, sex, or subspecies of rarities, information on these subjects is often provided during the review process. We have distilled much of this information into the following species accounts, while accepting responsibility for our interpretations of the Committee's comments. Intensive study of molt and age determination of nonpasserine land birds (doves through woodpeckers of AOU 1983 sequence) and passerines for a forthcoming identification manual (Pyle, in press) has refined our treatment of ageing/sexing birds reported here. Observers should recognize, however, that without considerable comparative experience, precise ageing/sexing of many species often may not be possible in the field.

The CBRC uses standardized abbreviations for California counties; those used in this report are ALA, Alameda; COL, Colusa; CC, Contra Costa; DN, Del Norte; IMP, Imperial; INY, Inyo; KER, Kern; LA, Los Angeles; MRN, Marin; MER, Merced; MNO, Mono; MTY, Monterey; ORA, Orange; RIV, Riverside; SBE, San Bernadino; SD, San Diego; SF, San Francisco; SJ, San Joaquin; SLO, San Luis Obispo; SM, San Mateo; SBA, Santa Barbara; SCL, Santa Clara; SCZ, Santa Cruz; SIS, Siskiyou; SON, Sonoma; VEN, Ventura.

Museums that house specimen records reported here, have allowed CBRC members access to specimens in their care, or are otherwise cited, are abbreviated as follows: CAS, California Academy of Sciences, San Francisco; LACM, Los Angeles County Museum of Natural History; SBCM, San Bernardino County Museum, Redlands. Other museum collections used regularly by Committee members include the Museum of Vertebrate Zoology, University of California, Berkeley, the San Diego Natural History Museum, and the American Museum of Natural History, New York.

RECORDS ACCEPTED

YELLOW-BILLED LOON *Gavia adamsii* (56). Three different individuals (subsumed into a single record because of confusion over how many immatures were seen, when and by whom) were in Monterey Bay, MTY, during mid November 1994 to mid March 1995: an adult, initially in alternate plumage, 7 Nov 1994–26 Mar 1995, and single immatures 12 Dec 1994–19 Mar 1995 and 29 Dec 1994–19 Mar 1995 (SFB, ADeM, TE, LL‡, GMcCh, JP, DR, SCR, DLS†, RLT†; 178-1994). A videotape of all three birds on 19 March 1995 helped the CBRC evaluate how many birds were involved in this unprecedented record.

LIGHT-MANTLED SOOTY ALBATROSS *Phoebetria palpebrata* (1). A single bird at Cordell Bank, MRN, 17 Jul 1994 (RS†; LL‡, BDP, LT‡, SBT†, AW†; 124-1994; Figures 3–4; photo in *Natl. Audubon Soc. Field Notes* 48:985) furnished the first Northern Hemisphere record for this beautiful subantarctic albatross. The issue of possible ship assistance was raised and felt to be unlikely, given the history of regular occurrence by Southern Hemisphere albatrosses in the Northern Hemisphere, albeit mainly in the Atlantic Ocean. The A.O.U. (1983) has abbreviated this species' traditional name, which we prefer, to "Light-mantled Albatross."

DARK-RUMPED PETREL *Pterodroma phaeopygia* (2). Single birds seen and well described at 37° 5.27'N, 123° 56.04'W (69.2 n. miles SW of Pt Reyes, MRN), 3 May 1992 (SFB, JDr, CBH, RWH, KHo, CHd, RN, GFW; 130-1992) and at 38° 28.0'N,

122° 27.1′ W (approximately 29 miles W of Granite Canyon, MTY), 26 Jun 1994 (SCR†; 121-1994; Figure 5), are the first accepted records of this species from California waters, where its occurrence had been anticipated (Pyle et al. 1993).

Although the provenance of California birds cannot be determined, the Hawaiian population (versus the Galapagos) seems more likely, cf. Spear et al. (1995). Sibley and Monroe (1993) treated these two forms as separate species, stating that they differ "in vocalizations and morphology to a degree suggesting specific status." This split is based upon Tomkins and Milne (1991), who did not, however, advocate specific status for the two forms and who properly noted that further study is needed.

Despite the statistical significance of differences in certain measurements between Galapagos and Hawaiian forms (Tomkins and Milne 1991: table 5), the overall differences are slight in absolute terms and unlikely to be of use at sea. Also, while Tomkins and Milne (1991: 33) cited Loomis (1918) as detailing plumage variation between the Galapagos and Hawaiian forms, that author (p. 101–102) noted overlap in both size and plumage between the two. Nonetheless, Hawaiian birds average larger (e.g., mean wing "length" of 312 mm versus 291 mm in Galapagos birds; Tomkins and Milne 1991: table 5) and appear consistently to have an all-white forehead, which in Galapagos birds is often (but not always) marked with slight dark freckling. For now then, forehead pattern is about all that birders have to go on, and an all-white forehead is equivocal! As with other petrels, however, critical appraisal of underwing patterns might reveal some differences; such an examination appears not to have been made, probably due largely to the traditional preparation of specimens, which have their wings tightly closed.

*MURPHY'S PETREL *Pterodroma ultima* (118). Four individual birds seen approximately 15–20 miles W of Cordell Bank, MRN, 1 Jun 1986 (ADB, JMD†, RAE, GSL, ML, GWW†, DGY; 401-1986, 402-1986, 403-1986, 404-1986) and one bird approximately 15 miles W of Cordell Bank, MRN, 7 Jun 1986 (DDeS; 406-1986) have been accepted as Murphy's Petrels, although two of the records (402-1986, 404-1986) were originally submitted as pertaining to Solander's Petrel (*P. solandri*). While Murphy's Petrel has proved to be a regular visitor to offshore California waters, there are no accepted state records of Solander's Petrel, a species of the western Pacific Ocean. See also under Records Not Accepted.

GREATER SHEARWATER *Puffinus gravis* (1). One was in Monterey Bay, MTY, 1–2 Oct 1994 (DLS; JMD†, RAE, GMcCa, DR; 144-1994; photos in *Natl. Audubon Soc. Field Notes* 49:95); a search on 3 October failed to find the bird. Despite this bird's being seen by numerous observers, only three full descriptions and one set of photographs were received. Ironically, this species was removed recently from the California state list (Erickson and Terrill 1996) on the basis of re-evaluation of a report from Monterey Bay in February 1979.

MANX SHEARWATER *Puffinus puffinus* (9). This species was added to the state list on the basis of several well-documented records in 1993 (Erickson and Terrill 1996), and the trend continued in 1994: one was about 5 miles W of Davenport, SCZ, 29 Aug 1994 (SFB; 131-1994), up to three birds were off Pt. Pinos, MTY, 21 Sep–5 Oct 1994 (JLD; ABu, RAE, GMcCa, JM, DR†; 152-1994), two were off Morro Bay, SLO, at 35° 17.32′ N, 121° 0.51′ W on 2 Oct 1994 (JB, CHd, BSc†; 140-1994), one was 3 miles SW of Table Rock, SCZ, 17 Dec 1994 (SA, DLS; 36-1995), and one was in Monterey Bay, MTY/SCZ, 30 Dec 1994 (SFB, DLS; 2-1995).

RED-TAILED TROPICBIRD *Phaethon rubricauda* (12). An adult was seen approximately 160 n. miles WSW of San Nicolas I., VEN, on 25 Jan 1994 (PP†; 52-1994), and an immature 84 n. miles W of San Nicolas I., VEN, on 29 Jan 1994 (PP; 53-1994). These parallel two January records in 1993 (Erickson and Terrill 1996),

suggesting that this species may be regular in winter far offshore of southern California.

MASKED BOOBY *Sula dactylatra* (7). A yellow-billed adult flew past SE Farallon I., SF, 9 Aug 1994 (PP; DWH; 181-1994), about 90 minutes after the observers had found an immature Brown Booby! A first-year bird was seen 3 miles S of White Point, LA, 30 Apr 1994 (MSM, SLW†; 84-1994).

The distribution of the different forms of Masked Boobies in the eastern Pacific Ocean presents an interesting pattern, noted in part by Patten and Erickson (1994), and more than one species may be involved (R. L. Pitman and J. R. Jehl, Jr., unpubl. data). Yellow-billed birds nest in Hawaii (*S. d. personata*), off western Mexico and on Clipperton I. (*S. d. californica*), and off Chile on San Ambrosio, San Felix, and Easter islands [subspecies unknown; attributed incorrectly to *granti* by Johnson (1965) and Patten and Erickson (1994)]. Birds nesting on the Galapagos and Malpelo I. (*S. d. granti*) are orange-billed, and adults and subadults are separated readily at sea from yellow-billed birds. On Clipperton and Mexico's Revillagigedo Islands, small numbers of *granti* nest among the many *californica* and mate assortatively, with little or no interbreeding (Pitman and Jehl unpubl. data).

Yellow-billed birds are more pelagic than *granti*, which favors more inshore waters for feeding and occurs commonly off SW Mexico (Howell and Engel 1993, Pitman and Jehl unpubl. data); *granti* also has been recorded in the Gulf of California (Tershy and Breese 1997) and off the Pacific coast of Baja California (Pitman and Jehl unpubl. data). Anyone lucky enough to see an adult or near-adult Masked Booby in California should make an effort to determine the bird's bill color.

BROWN BOOBY *Sula leucogaster* (44). Single first-year birds were at SE Farallon I., SF, 9 Aug–4 Sep 1994 (DWH, PP†; JM; 182-1994) and at the Angel's Gate entrance to Los Angeles harbor, LA, 14 Aug 1994 (JKA, KL†; 129-1994), continuing the trend of autumn records noted in 1993 by Erickson and Terrill (1996).

RED-FOOTED BOOBY *Sula sula* (11). A sick brown-morph bird found on the beach near Daly City, SM, 13 Jun 1994, was picked up dead there the next day (RB, KC; JM; 101-1994; #CAS 85273).

TRICOLORED HERON *Egretta tricolor* (14**). An immature at the NW corner of the Salton Sea, RIV, 2 Jan–12 Feb 1994 (GMcCa, MAP; 1-1994) was considered probably different from a bird at the mouth of the Whitewater R., 1 Oct 1993 (21-1994; Erickson and Terrill 1996). One and probably two adults, plus two begging juveniles, were at Ramer Lake, IMP, 6–14 Aug 1994 (GMcCa, MAP; 126-1994), implying that this species nested there amid the large heronry. Three alternate-plumaged adults at Obsidian Butte, IMP, *16 Jul* 1994, with one adult seen there again on 23 Jul and *14 Aug* 1994 (GMcCa, KLG, MAP; 107-1994), may have involved one or more of the Ramer Lake adults.

REDDISH EGRET *Egretta rufescens* (68). Single adults were at Seal Beach NWR, ORA, 24–30 Apr 1994 (JFt, DRW; 82-1994), at Bolsa Chica, ORA, 29 Apr–31 May 1994 (BED, RAE, DRW; 113-1994), and at Point Firmin, LA, 1 May 1994 (KL; 97-1994). Single immatures were at Obsidian Butte, IMP, 4 Sep 1994 (KLG; 202-1994) and at Famosa Slough/San Diego R. mouth, SD, 5 Nov 1994–15 Apr 1995 (SEF, MAP; 3-1995). An adult at Chula Vista, SD, 28 Aug–23 Dec 1994 (GMcCa; 155-1994) is considered a returning bird (with a deformed bill) that first appeared at the S end of San Diego Bay in 1982 (see Erickson and Terrill 1996). All accepted state records have been of dark-morph birds and are presumed to be of the northwest Mexican race *E. r. dickeyi*, in which a white morph is unreported.

YELLOW-CROWNED NIGHT-HERON *Nycticorax violaceus* (16). An adult at La Jolla, SD, 22 Jan 1994–26 Feb 1995 (PEL, SBT†; 60-1994) is considered the same

Figure 3. Light-mantled Sooty Albatross, Cordell Bank, Marin Co., 17 Jun 1994. Given such a view, this species is unmistakable: note the smooth-looking pale body in contrast to the dark hood and wings and, in particular, the pale blue line along the side of the lower mandible.

Photo by Scott B. Terrill

as that first seen near there in October 1981 (Binford 1985, Erickson and Terrill 1996). It is easy to "overlook" returning birds and assume (often wrongly) that someone else will document them: this bird barely made the report, and the Committee greatly appreciates the four-line description and two poor photographs submitted!

ROSEATE SPOONBILL *Ajaia ajaja* (5**). An immature at Fig Lagoon, 2 mi. SW of Seeley, IMP, 27–30 Dec 1994 (GMcCa, MAP†, BDS; 207-1994) was the first recorded in California since 1983. Committee review of this species began only after 1977.

WHOOPER SWAN Cygnus cygnus (2). An adult was at Lower Klamath NWR, SIS, 24 Nov 1991–18 Jan 1992 (RE; JA, SFB, JLD, SEF, FG, CM†, GMcCa, DLR, DR†, JS, MMT†, LT, SBT; 197-1991). California's first Whooper Swan was an adult near Grimes, COL, in January 1984 (Roberson 1986). Subsequent late-winter reports, all of a single adult, in California (Klamath Basin and Sacramento Valley, 1992/1993 through 1995/1996) and early-winter reports from Oregon (Summer Lake Wildlife Area, Nov–Dec 1994 and Nov–Dec 1995, presumably *en route* to points south) may be recurrences of this single bird.

EMPEROR GOOSE *Chen canagica* (59). A first-year bird was at Bodega, SON, *26 Dec* 1994–6 Jun 1995 (JAMcD; KFC, EG†, GMcCa, JM, BDP, DR, SCR, DSg, EGS; 5-1995).

Figure 4. Light-mantled Sooty Albatross with Black-footed Albatross (*Diomedea nigripes*), Cordell Bank, Marin Co., 17 Jun 1994. A unique combination: note the distintly different shapes of these two albatross genera.

Photo by Scott B. Terrill

Figure 5. Dark-rumped Petrel, 29 miles W Granite Canyon, Monterey Co., 26 Jun 1994. On the upperparts, note the long, tapered tail and long wings, typical of the Dark-rumped and Juan Fernandez (*Pterodroma externa*) petrels. The view of the underparts shows the dark underwing bar, dark hood, and long-winged appearance, diagnostic of the Dark-rumped Petrel.

Photos by Stephen C. Rottenborn

KING EIDER *Somateria spectabilis* (33). An immature male at Redondo Beach, LA, 28 May 1992 (JKA†; 130-1994) was considered probably the same individual as that at Seal Beach, ORA, 13–31 Dec 1991 and at Belmont Shores, LA, 9–17 Jan 1992 (213-1991). The discussion of this question revealed how little we know about the (winter) molt of immature King Eiders; a better understanding of the extent and timing of molts could lead to a re-evaluation of the same-bird question.

MISSISSIPPI KITE *Ictinia mississippiensis* (26). A bird in first-basic plumage was seen along the Owens River, 9 miles W of Westgard Pass, INY, 26 May 1994 (HK; 96-1994).

ZONE-TAILED HAWK *Buteo albonotatus* (48). In spring, single adults were reported over Valyermo, LA, 25 Apr 1994 (MSM; 83-1994) and over California City, KER, 26 May 1994 (GTo; 98-1994). Birds considered to be returning adults, at Goleta, SBA, 24 Aug 1994–16 Jan 1995 (ZL; ABi, SEF†, PEL, CM, GMcCa; 128-1994) and Laguna Hills, ORA, 17 Dec 1994–22 Jan 1995 (JEP; SEF†, GMcCa; 17-1995), and single juveniles at East Hicks Canyon, ORA, 12 Sep 1994 (KFC; 171-1994) and over Kit Carson Park, Escondido, SD, 19 Nov 1994 (GMcCa; 175-1994) are typical of the pattern in recent years, with a few birds occurring through autumn and winter in southern California. Descriptions of these birds varied in quality from poor (mostly) to good, and the descriptions of one supposedly returning wintering bird vacillated between characters more typical of a juvenile to those of an adult (despite this, the record was accepted)! Observers confronted with a Zone-tailed Hawk are cautioned to note the tail pattern carefully and, if possible, to sketch it. We note here that, *contra* Clark and Wheeler (1987), followed by Erickson and Terrill (1996), Zone-tailed Hawks are not sexed reliably by tail patterns, although there is a tendency for the sexes to differ (American Museum of Natural History specimens examined critically by Howell and sexed by unequivocal measurements). Also see Records Not Accepted.

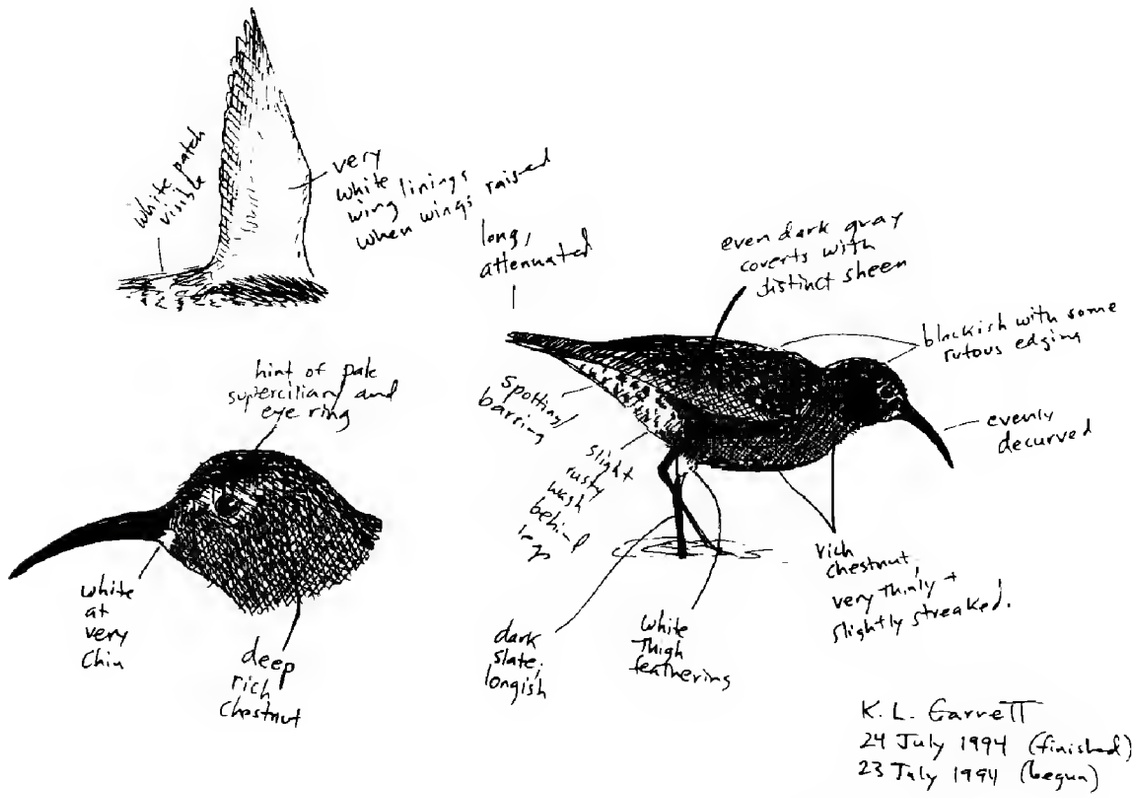
white patch visible
very white wing linings when wings raised
long, attenuated
even dark gray coverts with distinct sheen
blackish with some rufous edging
evenly decurved
hint of pale supercilium and eye ring
spotting/barring
slight rusty wash behind
rich chestnut, very thinly + slightly streaked
white at very chin
deep rich chestnut
dark slate, longish
white thigh feathering
K. L. Garrett
24 July 1994 (finished)
23 July 1994 (begun)

Figure 6. Curlew Sandpiper, Edwards Air Force Base, Los Angeles Co., 23 Jul 1994.

Sketch by Kimball L. Garrett

UPLAND SANDPIPER *Bartramia longicauda* (14). One at Twentynine Palms, SBE, 28 Sep 1994 (EAC†; 25-2995) was the latest for California by a week. Unfortunately, no written details accompanied the photograph, causing one member to reject the record (see the introduction to this report).

LITTLE CURLEW *Numenius minutus* (4). An adult at Carmel R. SB, MTY, 6–28 Sep 1994 (BHl; JLD†, EG†, DPH, LL‡, JM, DEQ, DR†, SCR, LT, SBT, BJW†; 137-1994; photo in *Natl. Audubon Soc. Field Notes* 49:97) was considered by only three Committee members to be the same bird as that at the Santa Maria R. estuary in August 1993 (125-1993; Erickson and Terrill 1996) and thus is treated here as a new record.

BAR-TAILED GODWIT *Limosa lapponica* (17). Single first-year birds showing the characters of the expected race *baueri* were at Moonglow Dairy, Moss Landing, MTY, 5–8 Sep 1994 (RC, DR†; BJW; 139-1994) and at Palo Alto Baylands, SCL, 9–24 Sep 1994 (NL, MM, JM, MMR†, SCR, SBT; 138-1994; photo in *Natl. Audubon Soc. Field Notes* 49:97).

LITTLE STINT *Calidris minuta* (6). A juvenile was found at Bolinas Sewer Ponds, MRN, on 22 Sep 1994, and what was considered to be the same bird, molting into first-basic plumage, was seen there again 9–10 Oct 1994 (TE†; SNGH; 204-1994).

RED-NECKED STINT *Calidris ruficollis* (8). Single alternate-plumage adults were at the Santa Clara R. estuary, VEN, 29 Jun–2 Jul 1994 (DDj†, SEF, PEL, NL, JM, MAP; 103-1994) and at the Santa Maria R. estuary, SBA, 11–15 Jul 1994 (BHn†; AME, RST†;110-1994).

Unlike the Little Stint, for which four of the six accepted California records have been of juveniles, all of the accepted Red-necked Stints have been adults in alternate plumage [despite the efforts of Veit (1988), the identification of a molting one-year-old

Figure 7. Adult Sooty Tern at Bolsa Chica, Orange Co., 10 Aug 1994.

Photo by Peter Knapp

Figures 8 and 9. Immature male Ruby-throated Hummingbird, SE Farallon I., SF, 7 September 1994. In particular, note the short bill and deep emerald-green, buff-fringed upperparts, including the crown. The blackish lores, whitish throat and underparts, and white postocular spot (versus line) eliminate Anna's, Costa's, and other similar North American hummingbirds.

Photos by Steve N. G. Howell

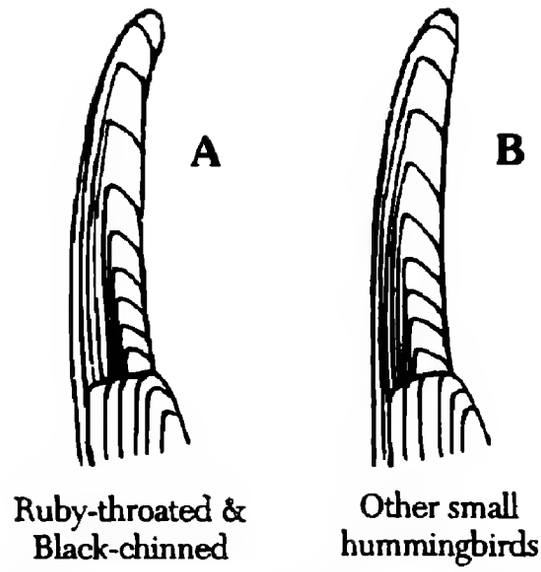

Figure 10. Shape of the closed primaries on A, *Archilochus* hummingbirds (Ruby-throated and Black-chinned); B, *Calypte* hummingbirds (Anna's and Costa's). With good views in the field, the relatively narrow inner six primaries of *Archilochus* are visible.

Sketch by Steve N. G. Howell, from Pyle (in press)

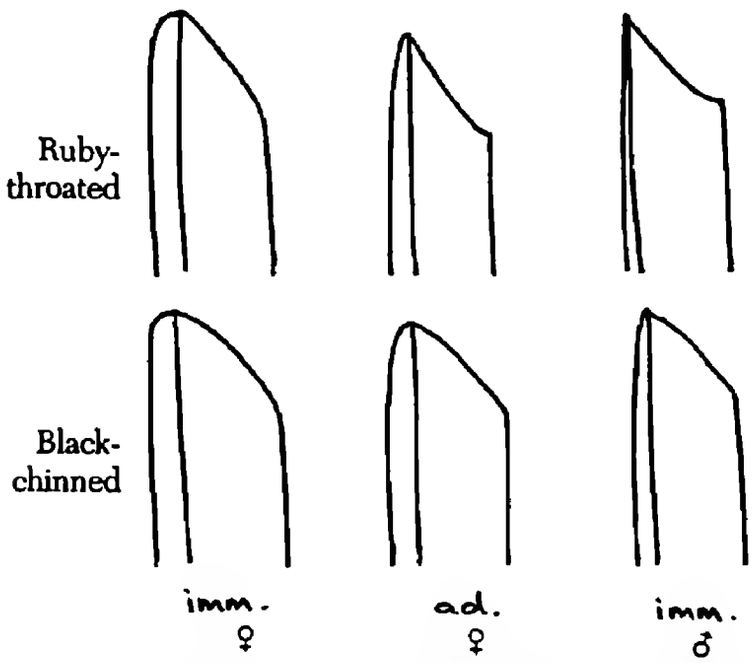

Figure 11. Differences in the shapes of primary 6 (numbered distally) of Ruby-throated and Black-chinned Hummingbirds, by age and sex. Note that the shape of this primary (blunt in females, pointed in males) can be used to sex autumn immatures (distinguished from adults by their fresh, buff-tipped upperparts). The "step" on the inner web, in combination with a more pointed tip, is helpful in distinguishing adult female and immature male Ruby-throateds from the Black-chinned; the feather shapes are more similar, however, in immature females.

Sketch by Steve N. G. Howell, from Pyle (in press)

bird collected at the south end of Salton Sea 17 Aug 1974 (McCaskie 1975) remains problematical and the CBRC has not accepted the record]. We suspect that this difference reflects an identification dilemma rather than a difference in the status of the age classes between these species.

CURLEW SANDPIPER *Calidris ferruginea* (18). One, starting its molt into alternate plumage, was at the mouth of the Whitewater R., Salton Sea, RIV, 16–26 Apr 1994 (TC, PAG, GMcCa; GCH, MAP; 76-1994; #SBCM 54281); on the last date it was shot by GCH and proved to be a female with ovary measuring 1.8 × 2.5 mm. An alternate-plumaged adult was at Piute Ponds, Edwards Air Force Base, LA, 23–24 Jul 1994 (NBB†, KLG, MSM; GM†; 108-1994; Figure 6).

LITTLE GULL *Larus minutus* (53). An adult and two first-winter birds were among a flock of Bonaparte's Gulls (*L. philadelphia*) at the Niland Marina, SE corner of Salton Sea, IMP, 24 Jan–*17 Feb* 1994; the two immatures were still present *24 Feb*, with one found dead there on 26 Feb (KLG†, PAG, MH, PEL, GMcCa, KCM, MAP; #LACM 107890; 47-1994). In addition, a first-winter bird was at Long Beach, LA, 16 Jan 1993 (KL; 99-1994), an alternate-plumaged adult flew past Hayward Shoreline, ALA, 18 Apr 1994 (RJR; 104-1994), and a second-winter bird was off La Jolla, SD, 18 Nov 1994 (GMcCa; 176-1994).

LESSER BLACK-BACKED GULL *Larus fuscus* (7). An adult was at Doheny SB, ORA, 27 Dec 1994–29 Jan 1995 (JEP; SEF†, JRG†, KLG†, EG†, RAH†, CJ†, CM†, GMcCa, JM, MAP, MSM, BDS; 206-1994; photo in *Natl. Audubon Soc. Field Notes* 49:198). Like others accepted from California (four of them from the Salton Sea and all adults), this bird showed the characters of the British race *graellsii*.

SOOTY TERN *Sterna fuscata* (2). An adult at Bolsa Chica Ecological Reserve, ORA, 30 Jul–10 Aug 1994 (DRW; NBB, BED, RAE, RAH, PK†; 109- 1994; Figure 7) constitutes the second state record. Erickson and Terrill (1996) detailed the checkered recent history of reports of dark-backed terns from the Bolsa Chica area.

Figure 12. Black-backed Wagtail, Crescent City, Del Norte Co., 7 Sep 1994. The extensively white wings and black mottling on the back of this bird distinguish it readily from the White Wagtail (*Motacilla alba*).

Photo by Gary S. Lester

THICK-BILLED MURRE *Uria lomvia* (33). Single individuals were seen approximately 2.8 miles off the Palos Verdes Peninsula, LA, 21 May 1994 (KLG; HK, KL†, AS; 92-1994), off Pt. Pinos, MTY, 5 Oct 1994 (NBB†, JLD†; 179-1994), and flying past SE Farallon I., SF, with a flock of 20 Common Murres (*U. aalge*) on 1 Nov 1994 (PP; 183-1994). The Los Angeles record is the first south of Monterey County and adds to the pattern of late spring and summer vagrant alcids (Parakeet, *Cyclorrhynchus psittacula*; Least, *Aethia pusilla*; Crested, *A. cristata*, auklets; Horned Puffin, *Fratercula corniculata*) from central and southern California and Baja California. The Farallon record parallels a similar, but not accepted, record of a bird flying past the island with a flock of Common Murres on 29 Oct 1988 (214-1988).

RUDDY GROUND-DOVE *Columbina talpacoti* (59). Three birds at Furnace Creek Ranch, INY, 14–31 May 1994 (GMcCa, MAP; 88-1994) were considered most likely to have been three of the five birds found at this site Oct–Nov 1993 (Erickson and Terrill 1996).

BROAD-BILLED HUMMINGBIRD *Cynanthus latirostris* (46). Singles were at Goleta, SBA, 1 Jan 1994 (PEL, CM, GMcCa; 11-1994) and 25 Dec 1994–28 Jan 1995 (SEF, RAH, PEL, CM, GMcCa; 7-1995), and at Iron Mountain Pumping Plant, SBE, *29* Oct–5 Nov 1994 (MAP†, BDS; 161-1994). An adult male at a feeder in Camarillo, VEN, 9 Oct 1994–5 Feb 1995 (PEL, CM; 8-1995) was considered the same male seen there in Nov and Dec 1993 (197-1993; Erickson and Terrill 1996).

Figure 13. Mourning Warbler with MacGillivray's Warbler (*Oporornis tolmiei*), SE Farallon I., San Francisco Co., 13 Sep 1994. Note the narrow, broken eyering and yellow median chest of the Mourning versus the thicker eye- crescents and dusky median chest of the MacGillivray's.

Photo by Steve N. G. Howell

RUBY-THROATED HUMMINGBIRD *Archilochus colubris* (3). An immature male was at SE Farallon I., SF, 7 Sep 1994 (SNGH†; 184-1994; Figures 8, 9). A critical precursor to finding a Ruby-throated Hummingbird is to become thoroughly familiar with the Black-chinned (*A. alexandri*), Anna's (*Calypte anna*), Costa's (*C. costae*), Calliope (*Stellula calliope*), and *Selasphorus* hummingbirds. Under favorable conditions, the relative widths of the inner six primaries (narrow in *Archilochus*, wide in the other genera; Figure 10) can often be seen on a perched bird, helping to narrow the choice down to Ruby-throated/Black-chinned. Separation of the Ruby-throated and Black-chinned hummingbirds in the field is often relatively straightforward given good views and critical field experience with one or both species. The glittering upperparts of both species change from a bluer to more golden green with wear, but the Ruby-throated is consistently more of an emerald green, a mark in itself that might draw attention to a vagrant in California (e.g., Figures 8, 9). The forecrown of the Black-chinned is consistently dusky grayish, not showing any distinct green tones, while that of the Ruby-throated typically is green but, on worn birds (mainly on the Mexican wintering grounds), can be dusky like a Black-chinned's. Thus, a green forecrown should be diagnostic of the Ruby-throated, although the green feathers are tipped with buff, and so less obvious, in fresh-plumaged immatures (e.g., Figure 8). The shorter bill of the Ruby-throated is useful (e.g., Figure 9), particularly if the bird's sex can be determined, while the shape of the primaries can be useful on birds in the hand (Phillips 1975, Pyle, in press; Figure 11). Differences in the timing of primary molt can also be useful with birds seen in winter (Baltosser 1995, Pyle et al. 1997), when crown color can be equivocal: in general, the Black-chinned's molt is about a month advanced over that of the Ruby-throated (reflecting the former's earlier breeding season), females and adults molting earlier than males and immatures.

EASTERN WOOD-PEWEE *Contopus virens* (3). One was heard singing and tape recorded at a campground 2 miles E of Big Pine Mt., SBA, 24 Jun–9 Jul 1994 (JTH§, CP, GTi; SEF, PEL, JEL, RL; 111-1994). The repeated full song was diagnostic, and the appearance, including pale underparts and a completely yellow lower mandible, was also indicative. The only other accepted records for California are of a bird captured and banded on SE Farallon I., SF, on 15 Jun 1975, and one singing near Manteca, SJ, 18 Aug–17 Sep 1983.

DUSKY-CAPPED FLYCATCHER *Myiarchus tuberculifer* (34). Individuals were on the Palos Verdes Peninsula, LA, 1–17 Jan 1994 (MH†; KL, CM; 55-1994), at the Carmel R. mouth, MTY, 11 Nov 1994 (DPH; 186-1994), in Huntington Beach, ORA, 28 Nov 1994 (JEP; RAE; 177-1994), and in Fountain Valley, ORA, 28 Dec 1994–15 Jan 1995 (CM, GMcCa, JEP, SBT†; 9-1995).

SCISSOR-TAILED FLYCATCHER *Tyrannus forficatus* (92). A female in first alternate plumage was collected by EAC at Harper Dry Lake, SBE, 18 May 1992 (38-1995; #SBCM 53745), a female or immature male was at Lake Hodges, SD, 4–17 Jan 1994 (GMcCa; 48-1994), a probable male was near Oasis, MNO, 28 May 1994 (BED; 117-1994), and a bird of unknown age and sex was at McGrath SB, VEN, 28 May 1994 (WW; 205-1994).

NORTHERN WHEATEAR *Oenanthe oenanthe* (7). Individuals, probably in first basic plumage, were near Nicasio, MRN, 27 Sep 1992 (JE†, DSf; 258-1992) and in La Mirada, LA, 5 Nov 1994 (WSS†; RP†, BP, JAJ, MSM; 167-1994). The latter is the first record for southern California.

VEERY *Catharus fuscescens* (9). One was at Point Reyes NS (Fish Docks), MRN, 4 Jun 1992 (SNGH; 144-1992).

GRAY-CHEEKED THRUSH *Catharus minimus* (17). Two were on SE Farallon I., SF, one on 20 Sep 1994 (PP†; 189-1994) and the other on 21 Sep 1994 (SNGH;

PP; 190-1994). The former, in first basic plumage, was caught and measured; photographs of it appear in McLaren (1995). The second bird was seen to lack a band and, unlike the first bird, did not have buffy tips to the greater coverts, which resulted in its age being left unknown. Both birds were too large and too gray for Bicknell's Thrush (*C. bicknelli*), which is unrecorded in the west; see Curson (1994), McLaren (1995), and Knox (1996).

GRAY CATBIRD *Dumetella carolinensis* (68). Birds in first basic plumage were caught, banded, and measured on SE Farallon I., SF, on 25 Sep 1994 (PP†; 191-1994), 28 Sep–10 Oct 1994 (PP†; SNGH†; 192-1994), and 2 Oct 1994 (PP†; 44-1995).

BLACK-BACKED WAGTAIL *Motacilla lugens* (5). An individual in adult basic plumage, probably a male, was found in Crescent City, DN, 6–7 Sep 1994 (KCK†; GSL†; 143-1994; Figure 12).

WHITE-EYED VIREO *Vireo griseus* (33). Singing males were near Corona, RIV, 18 May 1994 (MAP; 85-1994) and at Galileo Hill, KER, 28 May 1994 (JFs; 93-1994). One of unknown age and sex was caught and banded at the Big Sur Ornithology Lab, Andrew Molera SP, MTY, 4 Jun 1994 (CHo†; 105-1994).

YELLOW-THROATED VIREO *Vireo flavifrons* (55). One was near Desert Center, RIV, 14 May 1994 (BES†; 95-1994). A singing male near Weldon, KER, 7–30 Jul 1994 (DVB†, GMcCa; 125-1994) was the first to be recorded in Kern County.

PHILADELPHIA VIREO *Vireo philadelphicus* (96). One was at Los Osos, SLO, 19–20 Oct 1994 (KAH; 173-1994).

YELLOW-GREEN VIREO *Vireo flavoviridis* (39). Single individuals were at the Carmel R. mouth, MTY, 14–20 Oct 1992 (RC; BG; 310-1992), at Wilmington, LA, 16–17 Oct 1994 (MH†; KL†; 165-1994), and on SE Farallon I., SF, 17 Oct 1994 (PP; 193-1994). Plumage and/or eye color suggested that all three birds were immature.

BLUE-WINGED WARBLER *Vermivora pinus* (20). A singing male was at the Point Reyes Bird Observatory headquarters near Bolinas, MRN, 18 May 1994 (PP; 102-1994). A probable male (but possibly an adult female in basic plumage) was at L. Palmdale, LA, 31 Aug 1994 (CHd, NM, CDY; 132-1994).

GOLDEN-WINGED WARBLER *Vermivora chrysoptera* (51). A male was at Oasis, MNO, 8 May 1992 (BSi; 172-1992). A male was in Wilmington, LA, 27 May 1994 (PB; NBB, KL†; 94-1994). An adult female in basic plumage was in Arroyo Grande, SLO, 1–3 Oct 1994 (SM; JLD, CM, JM, SBT; 159-1994).

YELLOW-THROATED WARBLER *Dendroica dominica* (74). A male or adult female in basic plumage, evidently of the "white-lored" subspecies (*D. d. albilora*) was near Pescadero, SM, 29 Sep–5 Oct 1994 (BTM; AME, BDP, RST; 194-1994).

PINE WARBLER *Dendroica pinus* (51). A probable immature male was in Santa Barbara, SBA, 1 Jan–6 Feb 1994 (RAH; SEF, PEL, CM, GMcCa; 12-1994).

WORM-EATING WARBLER *Helmitheros vermivorus* (75). A bird found wintering in Santa Barbara, SBA, 1 Jan–12 Mar 1994 (PEL; SEF, CM, GMcCa; 13-1994) returned for its second winter, 24 Oct 1994–18 Mar 1995 (SEF, BHn, PEL, GMcCa; 34-1995). Individuals were in Death Valley NM (Scotty's Castle), INY, 14 May 1994 (PAG, GMcCa; 90-1994), at Twentynine Palms, SBE, 18 Jul 1994 (SIT†; 148-1994), in Wilmington, LA, 15–16 Oct 1994 (MH, KL; 26-1995), and at Westminster, ORA, 1–6 Nov 1994 (JEP; RAE, GMcCa, MAP, BDS; 166-1994). An adult was caught, banded and measured on SE Farallon I., SF, 21–24 Sep 1994 (PP†; 195-1994).

LOUISIANA WATERTHRUSH *Seiurus motacilla* (7). One was at Galileo Hill, KER, 16–18 Sep 1994 (JTH; MOC, JLD†, MTH†, GMcCa; 153-1994). A photograph of this bird appeared in *Natl. Audubon Soc. Field Notes* (49:102).

*KENTUCKY WARBLER *Oporornis formosus* (106). One was at Galileo Hill, KER, 22–23 Sep 1994 (MTH†; 196-1994). Because of its relative abundance in the state, highlighted by the spring and summer of 1992 (Patten and Marantz 1996), this species has been removed from the CBRC review list.

CONNECTICUT WARBLER *Oporornis agilis* (74). A male (PP†; SNGH†; 197-1994) and a female (SNGH; PP†; 198-1994) in first basic plumage were caught, banded, and measured on SE Farallon I. SF, both 18–20 Sep 1994.

MOURNING WARBLER *Oporornis philadelphia* (93). Individuals caught, banded, and measured included a male at Big Sur Ornithology Lab, Andrew Molera SP, MTY, 31 May 1994 (JDa; 106-1994), an immature male on SE Farallon I., SF, 29 Aug 1994 (PP†; 45-1995), and an immature, probably a female, at the latter location on 13 Sep 1994 (SNGH†; 199-1994; Figure 13). Another bird, an adult female, was seen on the same island on 25 Sep 1994 (SNGH, PP; 200-1994). In southern California, an immature male was observed near Trona, SBE, 17 Sep 1994 (MAP; GMcCa; 134-1994) and an adult male was present at Newport Beach, ORA, 31 Dec 1994–25 Feb 1995 (BED; SEF, CM, GMcCa, MAP; 11-1995). The latter is only the second wintering Mourning Warbler recorded in North America, the only previous record involving one in Wilmington, LA, 26 Dec 1981–28 Jan 1982 (Binford 1985).

SCARLET TANAGER *Piranga olivacea* (89). An adult male at least two years old was near Milpitas, SCL, 13–31 July 1994 (SCR†; JM, SBT; 122-1994). Males in first basic plumage were in Morro Bay SP, SLO, 2–13 Nov 1994 (SJH; KAH; 174-1994), and on the Palos Verdes Peninsula, LA, 6–15 Nov 1994 (KL†; 29-1995). A photograph of the latter individual appeared in *Natl. Audubon Soc. Field Notes* (49:103).

PAINTED BUNTING *Passerina ciris* (46). An adult-plumaged male was at Hole-in-the-Wall, SBE, 2–5 Sep 1993 (BHo†; JN; 137-1993). Birds in supplemental plumage were near Cantil, KER, 10 Sep 1994 (MTH†; 201-1994), and in Death Valley NM (Furnace Creek Ranch), INY, 25–27 Aug 1994 (GMcCa; 158-1994). The adult male was slightly faded, provoking concern that it had escaped from captivity. However, it was in the process of a normal molt (which cage birds may or may not show) out of worn plumage, and since the locality and date of occurrence were consistent with other records of this species in California, it was accepted on the fourth and final round.

FIELD SPARROW *Spizella pusilla* (5). Individuals showing the characters of the western subspecies, *S. p. arenacea*, were in Martinez, CC, 4 Jan–12 Apr 1994 (DSW; GF, EG†, JL†, CM, JM, BDP, DR, MMR, SBT; 14-1994), and in Huntington Beach, ORA, 20 Jan–13 Mar 1994 (RAH, GMcCa, JCW†; 56-1994).

LE CONTE'S SPARROW *Ammodramus leconteii* (26). A basic-plumaged bird was at Death Valley NM (Furnace Creek Ranch), INY, 5 Nov 1994 (DG, BGP†; 172-1994). A photograph of this individual appeared in *Natl. Audubon Soc. Field Notes* (49:103).

COMMON GRACKLE *Quiscalus quiscula* (34). One was at Cottonwood Springs Oasis, RIV, 17 Apr 1993 (DEQ; 73-1993). Males were at Panamint Springs, INY, 29 May 1994 (SBT†; 123-1994) and at Galileo Hill, KER, 29 Oct 1994 (CDY; MTH†; 164-1994). All were Bronzed Grackles, *Q. q. versicolor*, the only form of the Common Grackle recorded in California.

RECORDS NOT ACCEPTED: IDENTIFICATION NOT ESTABLISHED

SOLANDER'S PETREL *Pterodroma solandri*. Single birds seen approximately 15 miles W of Cordell Bank, MRN, 7 Jun 1986 (405-1986, 407- 1986) were insufficiently documented to allow specific identification. In large part this reflects the inadequate and misleading identification information then available concerning the appearance at sea of Solander's Petrel vis-à-vis Murphy's Petrel. Field-identification criteria for dark *Pterodroma* were subsequently elucidated by Bailey et al. (1989) and Spear et al. (1992).

*MURPHY'S PETREL *Pterodroma ultima*. Single birds seen approximately 9–17 miles W of Cordell Bank, MRN, 7 Jun 1986 (408-1986, 409-1986) were subsumed into the complex of confusing and inadequately described *Pterodroma* discussed above under Solander's Petrel. Also see Records Accepted.

WEDGE-TAILED SHEARWATER *Puffinus pacificus*. A dark-morph bird was seen 2 miles W of Table Rock, SCZ, 18 Dec 1993, on the Santa Cruz CBC (66-1994). This record was rejected 6:4 on the second round. Some committee members (including those with the most seabird experience) accepted the record, while others felt that details provided by one observer suggested the bird was not seen long enough to confirm the identification. Clearly, sightings of certain pelagic birds will always be troublesome.

MANX SHEARWATER *Puffinus puffinus*. A record of a bird seen briefly over Bodega Canyon, SON, 5 Nov 1994 (47-1995) was unconvincing.

*TUFTED DUCK *Aythya fuligula*. A bird reported 8 Sep–5 Oct 1991 at Hayward Shoreline, ALA (4-1992) was poorly documented.

MISSISSIPPI KITE *Ictinia mississippiensis*. Descriptions of a bird reported over Torrance, LA, 30 Apr 1994 (114-1994) and of two over Rancho Park Golf Course, LA, 3 May 1994 (91-1994) were unconvincing.

COMMON BLACK HAWK *Buteogallus anthracinus*. One was reported from Highway 195 near the N end of the Salton Sea, RIV, 13 Jun 1994 (116- 1994). This intriguing report did not convey enough detail for Committee members to accept a second state record of this extreme rarity.

ZONE-TAILED HAWK *Buteo albonotatus*. One was reported from the Pacific Coast Highway in Los Angeles, LA, 9 May 1994 (169-1994); a photograph does not support the record, suggesting a Red-tailed Hawk (*B. jamaicensis*) to at least two Committee members. Single birds reported over Highway 67 near Santee, SD, 4 Nov 1992 (56-1993) and over Palomar Airport Road, Carlsbad, SD, 23 Aug 1993 (34-1994) were not seen or described in enough detail to rule out other species, although the latter received a 5:5 vote. See comments under this species in Records Accepted.

CRESTED CARACARA *Caracara plancus*. An intriguing report of one 6 km SW of Coachella, RIV, on 9 Jan 1994 (18-1995) failed to gain acceptance largely because it was second-hand.

GYRFALCON *Falco rusticolus*. One reported near Midway, ALA, 27 Nov–14 Dec 1993 (5-1994) raised interesting issues: some members thought it was an immature gray-morph Gyr, others thought that the possibility of an escape could not be eliminated, while others felt that the description did not eliminate the possibility of an escaped hybrid! The record was rejected on the grounds of identification 6:4 on the second round. Sadly, the incidence of captive falcons is unlikely to decrease (e.g., an escaped adult Gyr had also been frequenting the same area as the rejected bird during the same period!), so any large falcon thought to be a Gyrfalcon should be studied carefully and also checked for signs of captivity.

WILSON'S PLOVER *Charadrius wilsonia*. A bird seen in flight at Ormond Beach, ORA, 31 Aug 1994 (163-1994) may have been of this species but members felt the sighting was too brief for a positive identification to be accepted.

LITTLE STINT *Calidris minuta*. A bird reported as a Little Stint was seen at San Joaquin Marsh, Irvine, ORA, 11 Sep 1994 (141-1994). Details were inadequate to support this difficult identification; for example, the observers did not determine the age of the bird, always a critical first step with an odd-looking shorebird. We recommend that observers become fully conversant with the age classes of the commoner shorebirds in fall because age-related plumage differences are often greater than differences among species. Thus, apparent "oddballs" can be basic-plumaged adults with a flock of juveniles of the same species, or vice versa.

WHITE-RUMPED SANDPIPER *Calidris fuscicollis*. A bird that may well have been this species was seen at Bodega Bay, SON, 20 Sep 1994 (160-1994). The descriptions submitted, however, did not fully establish the bird's identification, particularly in light of the brevity of the sighting and the extreme rarity of this species in California in autumn. As with the Little Stint (above), the age of this bird was not determined. The record was rejected 6:4 on the first round.

BLACK-HEADED GULL *Larus ridibundus*. A possible sighting of one in flight at the Santa Maria R. mouth, SBA, 29 Apr 1994 (87-1994) was too brief to establish such a rare occurrence.

WHITE-FRONTED SWIFT *Cypseloides storeri*. This record was submitted not because anyone really thought there was much likelihood that a White-fronted Swift, itself a controversial taxon (Navarro et al. 1992, Howell 1992, 1993, Peterson and Navarro 1993, Howell and Webb 1995) and one highly unlikely to reach North America, was involved, but rather to refute an unseasonally late report of the Black Swift (*C. niger*) from California. The bird in question was over Furnace Creek Ranch, INY, 2 Nov 1974 (62-1995; Garrett and Dunn 1981). The observer submitting the record provided no contemporaneous field notes, and the CBRC member with perhaps the greatest field experience with neotropical swifts thought that other descriptions (which did include copies of original field notes) were concordant with the Black Swift. The conspicuously protruding "spines" reported on this bird's tail by one observer were atypical for either a White-fronted Swift or a Black Swift; as the undescribed molt of the latter presumably occurs on the (unknown) winter grounds, a November Black Swift in worn plumage might show an apparently "spiny" tail. Another observer's field notes said, "Slow languid flight, fairly large. All black, white forehead." This description is fine for a Black Swift, and the slow languid flight should eliminate the heavy-bodied, fluttery White-fronted Swift (Howell and Webb 1995, Howell et al. in press). Needless to say, the record as a White-fronted Swift was rejected, and, while the original identification as a Black Swift has been challenged, a decision about the matter is beyond the scope of this Committee.

GREATER PEWEE *Contopus pertinax*. The description of a bird at Whittier Narrows Nature Area, LA, 9 Oct 1994 (156-1994) fit a Western Wood Pewee better than a Greater Pewee.

YELLOW-BELLIED FLYCATCHER *Empidonax flaviventris*. One was described from SE Farallon I., SF, 25 Aug 1992 (251-1992). The observers were distracted by a Red-faced Warbler (*Cardellina rubrifrons*) and a documentary film team on the island that day and thus were unable to capture and measure the bird. The record failed on the fourth and final round because two members were uneasy about accepting sight-only records of non-vocalizing individuals of this species, in combination with this bird's abnormally dark lower mandible (which would have been abnormal for similar species of *Empidonax* as well).

ALDER FLYCATCHER *Empidonax alnorum*. The CBRC is not yet ready to accept as Alder Flycatchers migrant "Traill's" Flycatchers giving "peek" call notes, such as one at Galileo Hill, KER, 11 Sep 1994 (185-1994). See Patten et al. (1995) for further discussion on this topic.

RED-THROATED PIPIT *Anthus cervinus*. A pipit observed near Port Hueneme, VEN, 13 Oct 1991 (225-1991) was not heard calling, and the plumage description fell short of eliminating other potentially occurring pipits.

SPRAGUE'S PIPIT *Anthus spragueii*. The description of a bird seen at Merced NWR, MER, 15 Jan 1994 (20-1994) did not eliminate several species of sparrows found on this refuge in winter.

GRAY CATBIRD *Dumetella carolinensis*. A bird observed at Moss Landing, MTY, 27 Sep 1993 (73-1994) was glimpsed from a distance of 70 to 80 yards.

BLUETHROAT *Luscinia svecica*. A bird seen near Olema, MRN, 9 Apr 1994 (78-1994), was identified due its greater similarity to a field-guide picture of this species than to any other species in the guide. Beginners are cautioned that this method does not produce accurate identifications. The Committee unanimously felt that the bird was not a Bluethroat and was probably a Hermit Thrush (*Catharus guttatus*).

YELLOW-THROATED VIREO *Vireo flavifrons*. A bird heard singing and seen briefly in San Rafael, MRN, 28 April 1992 (181-1992) was considered probably of this species by the Committee, but the description's being written several months after the encounter caused the record's rejection in the end.

PHILADELPHIA VIREO *Vireo philadelphicus*. Descriptions of birds observed at Buena Vista L. Recreation Area, KER, 5 May 1994 (118-1994) and at the Carmel R mouth, MTY, 2 Oct 1994 (145-1994) better fit other species of vireos. The former would have been the earliest spring record in the state by 18 days.

WORM-EATING WARBLER *Helmitheros vermivorus*. Details concerning a bird at Redondo Beach, LA, 26 May 1992 (192-1992) were unconvincing.

KENTUCKY WARBLER *Oporornis formosus*. The described song of a bird heard near Chilao, San Gabriel Mts., LA, 15 Jun 1992 (199-1992) was correct for this species, but the plumage description left too much to be desired.

SCARLET TANAGER *Piranga olivacea*. A bird photographed at Twentynine Palms, SBE, 18 May 1994 (27-1995) was almost unanimously considered a Summer Tanager (*P. rubra cooperi*) by the Committee. A male observed briefly at Point Loma, SD, 24 Aug 1994 (28-1995) was in transitional green and red plumage. This plumage would not be found on a migrant Scarlet Tanager, and it was felt unlikely that the bird had summered at this well-birded locale. Alternatively, a male Summer Tanager molting from first alternate (green) to adult basic (red) plumage would be far more likely there on this date.

RECORDS NOT ACCEPTED: NATURAL OCCURRENCE QUESTIONABLE

RUDDY GROUND-DOVE *Columbina talpacoti*. A male at the Fillmore Fish Hatchery, VEN, 24–25 Nov 1978 (REW; 31-1981) was rejected on the basis of its possibly being an escapee. The coastal location and early date (1978), somewhat predating the spread of this species in the 1980s as an autumn–winter vagrant to the interior southwestern USA, were factors which also contributed to the 7:3 rejection of this record.

GRAY SILKY-FLYCATCHER *Ptilogonys cinereus*. One near Poway, SD, 10–12 Mar 1994 (BB; NBB†, JC, RAH†, GMcCa, MAP, MBS†, MMT†, SW, JOZ; 75-1994)

had a badly frayed tail and uneven primary tips, suggesting that it had been in captivity. As this species is commonly kept as a cage bird in nearby Mexico, it was unanimously considered a probable escapee by the CBRC.

PAINTED BUNTING *Passerina ciris*. An adult-basic male in Del Mar, SD, 23 Feb 1994 (PAG; 80-1994) was observed at a feeder. The origin of birds of this age/sex group at feeders in the winter are routinely questioned by the CBRC, and this one was—unanimously.

CONTRIBUTORS

Doug Aguillard, Jonathan K. Alderfer, Steve Allison, Janice Anderson, Stephen F. Bailey, Raymond Bandar, Peter Barnes, Alan D. Barron, Barbara Bell, Allyn Bissell (ABi), David V. Blue, N. Bruce Broadbooks, Andreas Buchheim (ABu), Jared Burton, Kurt F. Campbell, Eugene A. Cardiff, Rita Caratello, Karen Cebra, Daniel Christian, Mark O. Chichester, Therese Clawson, Jim Coatsworth, Brian E. Daniels, J. Michael Danzenbaker, Jeff Davis (JDa), Al DeMartini, David DeSante (DDeS), Don Desjardin (DDj), John Drummond (JDr), Jon L. Dunn, K. Earnshaw, Todd Easterla, Alan M. Eisner, Ray Ekstrom, Theodore L. Eliot, Jr., Richard A. Erickson, Jules Evens, Krista A. Fahy, George Finger, Shawneen E. Finnegan, Jon Fisher (JFs), John Fitch (JFt), G. Bill Foster, James R. Gallagher, Sylvia R. Gallagher, Frank Gardner, Kimball L. Garrett, Bruce Gerow, Peter A. Ginsberg, David Goodward, Ed Greaves, Robert A. Hamilton, Keith Hansen (KHa), Joan T. Hardie, David P. Haupt, Karen A. Havelina, Carl B. Haynie, Gjon C. Hazard, Matt T. Heindel, Mitch Heindel, Sandra J. Heinemann, Bill Hill (BHl), Brad Hines (BHn), Robert W. Hirt, Craig Hohenberger (CHo), Ken Hollinga (KHo), David W. Holmes, Charles Hood (CHd), Becca Hooker (BHo), Steve N. G. Howell, Curtis Johnson, Jerome A. Johnson, Howard King, Peter Knapp, Keith C. Kwan, Kevin Larson, Zev Labinger, Paul E. Lehman, Joan E. Lentz, Gary S. Lester, Nick Lethaby, Clarann Levakis, Leslie Lieurance, Roger Linfield, Mike Lippsmeyer, James Lomax, Gene Lynch, Gerald Maisel, Michael Mammoser, Curtis Marantz, Guy McCaskie (GMcCa), Gerry McChesney (GMcCh), John A. McDonagh, Bert T. McKee, W. Graham Metson, Jr., Nina Merrill, Steve Mlodinow, Kathy C. Molina, Joseph Morlan, Jack Nash, Rod Norden, Jeff Paklen, Benjamin D. Parmeter, Michael A. Patten, Rafael Payne, Cruz Phillips, James E. Pike, Brian G. Prescott, Bill Principe, Peter Pyle, David E. Quady, Marisol Quintana-Galetovic, William Reese, Dan L. Reinking, Robert J. Richmond, Don Roberson, Michael M. Rogers, Stephen C. Rottenborn, Mike San Miguel, Marilyn Schmitz, Brad Schram (BSc), Debra L. Shearwater, David Shock (DSk), David Shuford (DSf), Brad Sillasen (BSi), Daniel Singer (DSg), Arnold Small, Brian E. Small, Brenda D. Smith, W. Scott Smithson, John Sterling, Mary Beth Stowe, Ellen G. Strauss, Monte M. Taylor, Scott I. Taylor, Richard L. Ternullo Linda Terrill, Scott B. Terrill, Ronald S. Thorn, Guy Tingos (GTi), Gerald Tolman (GTo), Rich Trissel, Ron Vanderhoff, George F. Wagner, Stan Walens, Charlie Walker, S. L. Warter, Richard E. Webster, Brian J. Weed, Walter Wehtje, George W. Welch, Alan Wight, Denise S. Wight, Douglas R. Willick, John C. Wilson, David G. Yee, Callyn D. Yorke, James O. Zimmer.

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STATUS AND BREEDING ECOLOGY OF THE SOUTHWESTERN WILLOW FLYCATCHER IN THE GRAND CANYON

MARK K. SOGGE, U.S. Geological Survey Biological Resources Division, Colorado Plateau Research Station, P. O. Box 5614, Flagstaff, Arizona 86001

TIMOTHY J. TIBBITTS, Division of Resources Management, Organ Pipe Cactus National Monument, P. O. Box 100, Ajo, Arizona 85321

JIM R. PETTERSON, Grand Canyon Science Center, Grand Canyon National Park, Arizona 86023 (currently at Organ Pipe Cactus National Monument, P. O. Box 100, Ajo, Arizona 85321).

Empidonax traillii extimus is one of several recognized subspecies of the Willow Flycatcher (Unitt 1987, Browning 1993), a neotropical migrant that breeds across much of North America. This southwestern race is a riparian obligate, nesting in dense patches of willow (*Salix* sp.), willow-cottonwood (*Populus* sp.), or other similarly structured habitats. In some areas of the Southwest, it nests in dense stands of tamarisk (*Tamarix* sp.). Willow Flycatchers were once widespread and locally common in the Southwest (Unitt 1987) but have declined to the point that *E. t. extimus* was listed as an endangered subspecies in 1995 (USFWS 1995).

Southwestern Willow Flycatchers have consistently nested along the Colorado River in the Grand Canyon in recent years. Reaching most portions of the Colorado River from Lee's Ferry downstream to Lake Mead was difficult and expensive prior to the construction and operation of Glen Canyon Dam in 1963, so information on the flycatcher's historical status and distribution in the Grand Canyon region is limited. The first record is of a single male collected at Lee's Ferry (where access was relatively easy) in 1909 (Woodbury and Russell 1945). The Lee's Ferry area also produced several other records, including a specimen collected on 7 June 1933 (Brown 1988), a used nest in the willows on 11 August 1935 (Woodbury and Russell 1945), and four adults (two male, one female, and one of unknown sex) collected by C. M. White on 29 June 1961 (University of Utah Museum specimen numbers 16718–16721). Historical records below Lee's Ferry are few: one was collected on 2 September 1931 by Vernon Bailey along the river corridor near Lava Canyon (McKee 1931), approximately 105 km downstream of Lee's Ferry, and another was taken at the confluence with the Little Colorado River on 17 June 1953 (Monson 1953). Willow Flycatchers were probably never common breeders in the Grand Canyon below Lee's Ferry because before Glen Canyon Dam was built this stretch of the river was subject to annual floods that scoured the river's edge and prevented the establishment of large patches of willow/cottonwood/tamarisk habitat (Turner and Karpiscak 1980). As recently as the 1970s, only one nesting pair was known in the Grand Canyon (Carothers and Sharber 1976).

In contrast, above Lee's Ferry where the Colorado River flowed through Glen Canyon and along the tributary San Juan River, Willow Flycatchers were relatively common summer residents (Woodbury and Russell 1945, Behle and Higgins 1959). Here, the river dropped less steeply and moved more slowly, allowing the development of extensive stands of dense riparian habitat well suited for breeding flycatchers (Woodbury and Russell 1945). During a single census conducted on 8 August 1938, in one willow patch 68 km above Lee's Ferry, Woodbury and Russell (1945)

Behle and Higgins 1959). Here, the river dropped less steeply and moved more slowly, allowing the development of extensive stands of dense riparian habitat well suited for breeding flycatchers (Woodbury and Russell 1945). During a single census conducted on 8 August 1938, in one willow patch 68 km above Lee's Ferry, Woodbury and Russell (1945) detected eight flycatchers, more than the cumulative total historically recorded in the 450 km of river corridor downstream of Lee's Ferry to Lake Mead. Unfortunately, this habitat was inundated and destroyed when Lake Powell filled between 1964 and 1980 (Stevens 1983).

Brown (1988, 1991) documented the distribution and abundance of the Willow Flycatcher in the upper Grand Canyon from 1982 to 1991 and described how post-dam increases in riparian vegetation may have provided habitat for increased numbers of breeding flycatchers. From 1982 to 1991, the number of singing flycatchers detected each year varied from 2 to 11, with a maximum of four nests found in any one year (Brown 1988, 1991). The flycatchers bred at only four sites scattered over 40 km of river, where relatively wide, slow-moving stretches with associated eddies or backwater sloughs supported a structurally varied canopy of tamarisk-dominated vegetation near the nest site (Brown and Trosset 1989). Brown (1994) found that flycatchers breeding in the canyon were subject to very high rates of nest parasitism by Brown-headed Cowbirds (*Molothrus ater*).

Although the Willow Flycatcher population in the canyon is small, it is of scientific and management interest because it is one of the longest continuously monitored populations in the Southwest. It is also subject to potential human-related disturbances from recreational impacts and habitat changes brought about by the operation of Glen Canyon Dam. Here we report the results of an additional five years (1992–1996) of intensive flycatcher research and monitoring efforts in the Grand Canyon. We present new information on patterns of distribution, habitat characteristics, population trends, productivity and breeding ecology, and details of an observation of a female singing.

METHODS

From 1992 to 1996, we conducted 838 flycatcher surveys at 182 different habitat patches along the Colorado River in the Grand Canyon. At least four survey trips were conducted each year, and all patches were surveyed at least twice per year. Surveys were conducted from mid-May through July, and included riparian patches from just below Glen Canyon Dam downstream to the boundary between Grand Canyon National Park and Lake Mead National Recreation Area (Figure 1). Sites were named according to their location in river miles (RM) relative to Lee's Ferry, following Stevens' (1983) designations. We surveyed primarily from 05:00 to 10:00 daily, using the protocol of Tibbitts et al. (1994), which involves using a tape player to broadcast taped flycatcher songs to elicit a singing response from any nearby territorial flycatcher. Surveyors walked through, or adjacent to, surveyed habitats whenever possible. Where terrain or dense vegetation prohibited walking, we surveyed from boats drifting slowly past habitat patches.

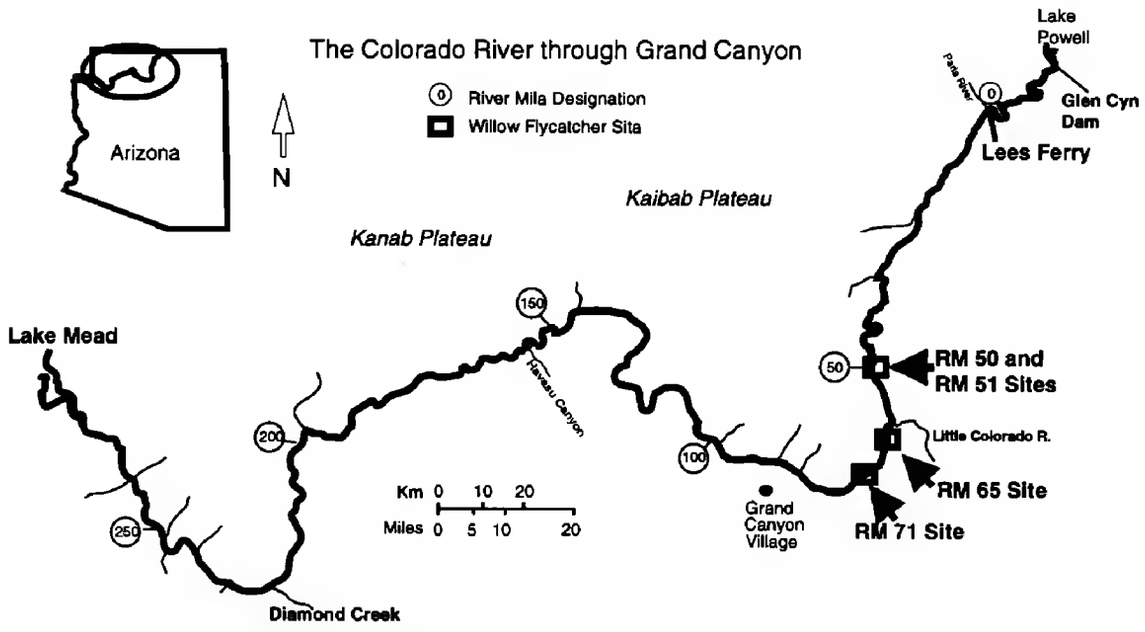

Figure 1. Distribution of Southwestern Willow Flycatcher breeding sites along the Colorado River in the Grand Canyon, Arizona, 1992–1996. RM refers to the river mile designation for that site.

We also monitored flycatcher nesting efforts at all four known breeding sites between 74 and 114 km downstream of Lee's Ferry. Extra time was spent at breeding sites to determine the flycatchers' number and sex, their approximate territories (by recording activity patterns on aerial photographs of each site), and to record their behavior. Nests were inspected by means of binoculars, mirror-poles, and micro-video cameras, and we noted clutch size, number and age of young, and presence of cowbird eggs or young. For each nest, we recorded the species of nest plant, height of nest plant and nest, distance to top of canopy over the nest, and horizontal distance from the nest to the closest surface water and the closest edge of the habitat patch. At all patches surveyed and territories monitored, we also recorded the presence of cowbirds, noted cowbird behavior, and recorded any flycatcher response. Statistical analyses were conducted using SPSS software, and unless otherwise noted values reported are the mean plus or minus one standard deviation.

RESULTS

Abundance

Resident Breeders. The breeding population of flycatchers in the Grand Canyon continues to be small (mean 2 ±1 pairs/yr) with no clear trend (Figure 2). The high count of four pairs (in 1994) followed a year in which no young were fledged from the study areas, suggesting that at least some of the new breeders in 1994 came from other populations. Depending on the year, one or two breeding pairs were found at one or more of the sites at RM 50, RM 51, and RM 71. In 1993, one patch contained a polygynous male with

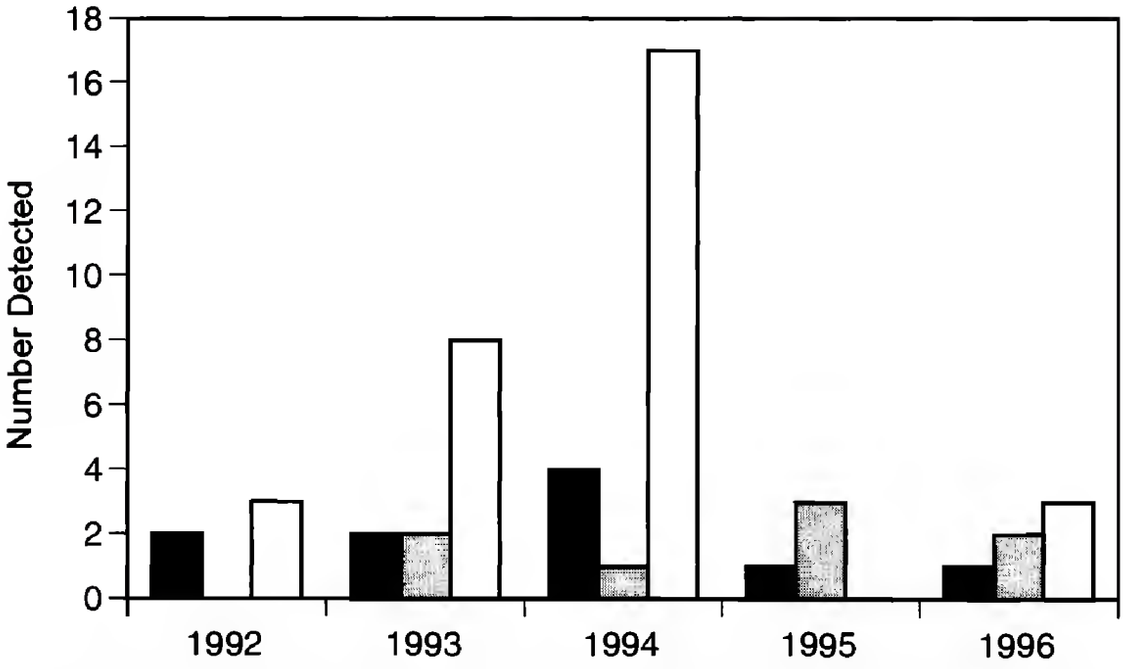

Figure 2. The number of Willow Flycatchers detected each year during surveys in the Grand Canyon, 1992–1996. Black bars, breeding pairs; gray bars, territorial unpaired males; white bars, migrants.

two concurrently nesting females (this polygynous trio is treated as one pair in all subsequent analyses).

Unpaired Territorial Males. In all years except 1992, we found one or more male flycatchers that established territories but did not secure a mate and breed (Figure 2). Each of these unpaired males was present on its territory during multiple surveys from mid-May and early June through at least early July. They were typically very vocal and responsive to the survey tape, at least through late June. Overall, the mean number of unpaired males each year (2 ± 0.8) was the same as the mean number of breeding pairs, although the two were not correlated. Unpaired males accounted for 0 to 75% of the territories in a given year, and 44% of all territories detected over the course of our study.

Migrants. We defined a migrant as any flycatcher that was detected on only one survey and absent on previous and subsequent surveys at the same site. In some cases, migrants responded strongly to the survey tape, in much the same manner as territorial birds. In other cases, migrants responded with only a few songs, and sometimes took several minutes to do so. The number of migrants varied greatly from year to year (Figure 2), with a maximum of 17 in 1994. The greatest number of migrants was detected in mid-May, with declining numbers present through mid-June (Figure 3).

Floaters. We detected three flycatchers that could not readily be classified as either territorial or migrants, which we designate as non-territorial floaters (Gill 1995). One floater was present for two days (18–19 June 1992) 308 km downstream of Lee's Ferry (RM 191) but not observed on subsequent surveys. Another was found singing spontaneously and continuously on the mornings of 17 and 18 June 1993 near the Lake Mead/Grand Canyon

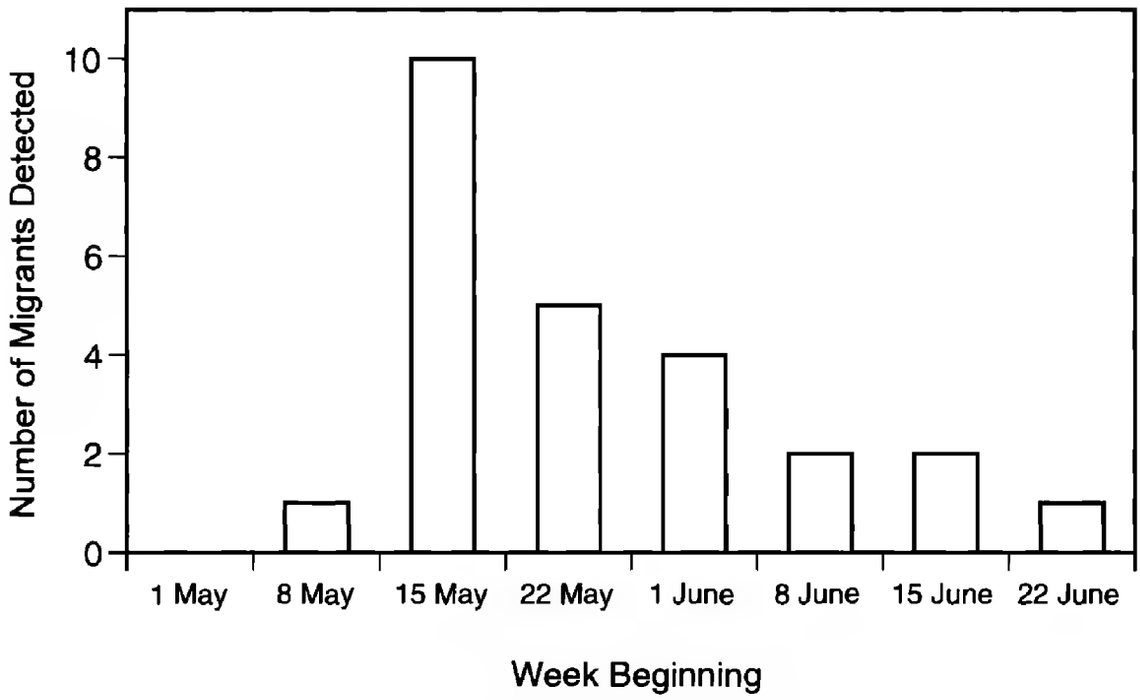

Figure 3. The total number of migrant Willow Flycatchers detected along the Colorado River in the Grand Canyon, 1992–1996.

boundary (RM 276) but was not seen during surveys three days before or two weeks after. It appeared that this flycatcher may have tried to establish a territory but did not remain long enough for us to classify it as a unpaired territorial male. The other floater was captured 76 km below Lee's Ferry (RM 47) on 9 July 1993, well past the time when migrants would be expected (Unitt 1987). However, intensive surveys before and after the capture found no resident flycatchers at this site.

Distribution and Habitat Use

Willow Flycatchers were detected at 21 sites along the river corridor from 18 km above (RM −11) to 114 km below Lee's Ferry (RM 71) and at four sites from 270 km (RM 168) to 477 km (RM 296) downstream of Lee's Ferry. None were detected in the middle reach of the river, where woody riparian vegetation is relatively uncommon (Turner and Karpiscak 1980). The flycatchers bred at only three sites (RM 50, RM 51, and RM 71; Figure 1); an unpaired male established a territory at RM 65 but did not breed during the time it was there (1994 and 1995). Only migrants and floaters were detected at the other sites.

We found flycatcher territories in the tamarisk-dominated riparian vegetation along the river corridor but not in the mesquite- (*Prosopis juliflora*), acacia- (*Acacia greggii*), and hackberry- (*Celtis reticulata*) dominated habitats higher on the slopes. The area of tamarisk-dominated habitat at breeding sites ranged from 0.6 to 0.9 ha (Table 1), but the flycatchers used only a portion of the habitat patch. Territory sizes were variable, and the largest territory was that of the unpaired male at RM 65 (Table 1).

Table 1 Area of Riparian Habitat and Associated Territories at Willow Flycatcher Breeding Sites along the Colorado River in the Grand Canyon, 1992–1996

Site	Size of riparian habitat patch (ha)	Territory size (ha)
RM 50	0.6	0.1
		0.06
		0.2
RM 51	0.6	0.1
		0.07
RM 65[a]	0.7	0.5
RM 71	0.9	0.12
		0.08
Mean ± SD	0.7±0.14	0.16±0.15
		0.10±0.05[b]

[a]Occupied by a non-mated territorial male. All other territories included breeding pairs.
[b]Value excludes the unpaired male's territory from RM 65.

Nests and Nest Placement

We found only a few nests each year (mean 3.4 ± 3.2, range 1–9; Table 2, Figure 4). Replacement nests (following failed earlier attempts) accounted for 7 of 17 nests. All nests were placed in tall (≥ 5 m) tamarisk, within 30 m of surface water and no more than 25 m from the nearest edge of the habitat patch (Table 3). Nest height was significantly correlated with nest plant height (Pearson's $R^2 = 0.79$, $p < 0.01$). Concurrent nests in adjoining territories were as close as 15 m apart. Replacement nests were built 5–24

Table 2 Nesting Effort and Nesting Success of Southwestern Willow Flycatchers Breeding along the Colorado River in the Grand Canyon, 1992–1995.

	1992	1993	1994	1995	1996	Total
Breeding pairs	2	2	4	1	1	na
Nest attempts	2	3	9	1	2	17
Successful nests	1 (50%)	0 (0%)	0 (0%)	1 (100%)	1 (50%)	3 (18%)
Parasitized nests	0 (0%)	3 (100%)	4 (44%)	1[a] (100%)	0 (0%)	8 (47%)
Nests failed, unknown cause	1 (50%)	0 (0%)	5 (56%)	0 (0%)	1 (50%)	7 (41%)
Young fledged	1–3	0	0	1–2	1–2	3–7

[a]When first checked, this nest contained only a single cowbird egg. Later checks revealed the cowbird egg gone or buried and three flycatcher eggs in its place.

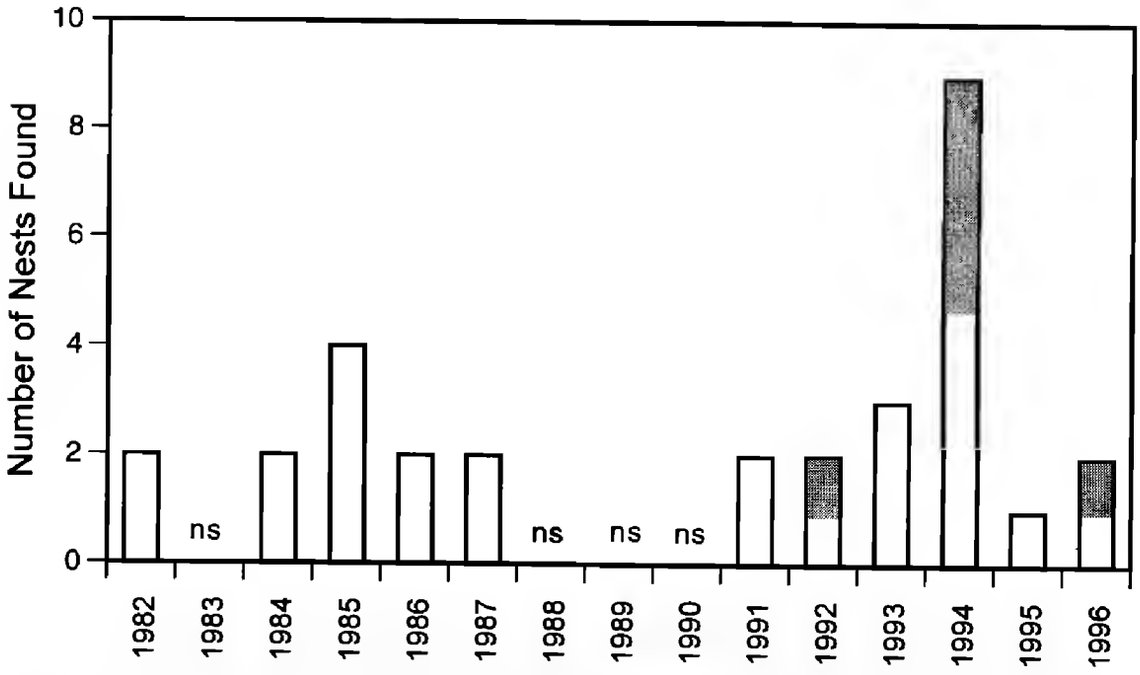

Figure 4. The number of Southwestern Willow Flycatcher nests found each year in the Grand Canyon, 1982–1996. Data for 1982–1991 are from Brown (1988, 1991); ns signifies that no searches were conducted that year. Shaded portions represent renesting attempts following failed first nests (unknown for 1982–1991 data).

m from the first nest (mean 11 ± 8 m, n = 5). Nests were constructed primarily or entirely of tamarisk leaves and supported by vertically angled forks of small branches and twigs.

Breeding Ecology

In most years, resident males were first detected in the third week of May, but this may be an artifact of the timing of our first survey trips, typically launched during this time. Our earliest record of a male on breeding territory is 8 May, suggesting that they may generally arrive earlier than our surveys suggest. Unpaired males were detected as early as 22 May and were usually present each year until at least 4 July (13 July is our latest record) but were absent during surveys later in July. Most nesting activity was noted from early June through mid-July. Our earliest recorded nest was under construction 22 May. The earliest date for flycatcher eggs was 30 May (2 eggs), although a Brown-headed Cowbird egg was found in a flycatcher nest on 23 May. Earliest and latest dates that we detected nestlings were 29 June (chicks approximately 8 days old) and 13 July (chicks approximately 10 days old), respectively. Dates of earliest and latest recorded fledging were 29 June and 13 July, respectively. Adult flycatchers were observed feeding fledged young on 2 and 21 July.

Because of the timing of survey trips and the high proportion of parasitized nests, we determined clutch size for only three unparasitized nests (each with three eggs). Of six parasitized nests found during the incubation period, five had two flycatcher eggs with one cowbird egg, while the sixth had three flycatcher and one cowbird egg. The reduced

Table 3 Characteristics of Southwestern Willow Flycatchers nests in the Grand Canyon, 1992–1996[a]

Variable	All nests (n=12)	Parasitized nests (n=8)	Nonparasitized nests (n=4)	Significance (t test)
Height of nest plant (m)	7.3±2.1 (5–13)	7.5±2.4 (5–13)	6.5±1.3 (5–8)	p=0.5
Height of nest (m)	4.8±0.8 (4–6)	4.8±0.8 (4–6)	4.5±0.7 (4–5)	p=0.6
Distance from nest to closest edge of habitat (m)	10.8±6.6 (5–25)	8.1±4.0 (5–16)	16.5±7.8 (7–25)	p=0.04[b]
Distance from nest to closest surface water (m)	14.5±6.7 (5–30)	13.0±5.6 (5–20)	17.8±9.7 (7–30)	p=0.3
Distance from nest to top of nest-plant canopy (m)	2.6±1.5 (1–7)	2.8±1.8 (1–7)	2.0±1.1 (1–4)	p=0.4

[a]Values given are mean ± one standard deviation, with range in parentheses.
[b]Significant at $p < 0.05$.

number of flycatcher eggs in most parasitized nests as compared to unparasitized nests suggests that female cowbirds may be removing a flycatcher egg when they parasitize the nest.

Annual nesting success varied greatly over the course of the study (Table 2). Overall, nesting success (the percentage of nests that fledged one or more flycatchers) was low, with 82% of nests failing because of cowbird parasitism or other unknown causes. Interestingly, the annual number and percentage of successful nests was not significantly correlated with either the number of nest attempts or the number of breeding pairs in a given year (Pearson's R^2= 0.55, $p > 0.05$). Young flycatchers fledged in only three of five years, and in each of these years all fledged young came from only one nest. Because of the timing of survey trips and concerns about visually checking the nest immediately prior to anticipated fledging, we were unable to verify the exact number of fledglings from each nest. Even if all nestlings in the successful nests fledged, only seven flycatchers fledged during the 5-year study (Table 2), with a mean number of young produced per pair per year of only 0.7 ± 1.2. We found no second nesting attempts following a successful first nest. In five of six cases, breeding flycatchers attempted a second nest after failure of first nests. We found only one case suggesting a third (and unsuccessful) nesting attempt after the first two failed.

Brown-headed Cowbird Abundance and Nest Parasitism

Cowbirds were found at virtually every site occupied by breeding or territorial flycatchers. Female cowbirds were often seen moving slowly through the habitat patches, characteristic behavior of searching for host nests (Lowther 1993). On several occasions resident flycatchers confronted cowbirds with aggressive actions such as tail fanning, erected crest, flying

directly at the cowbird, loud *whitting*, and bill-clacking. At least once, the flycatcher physically contacted the cowbird when it approached within 2 m of the flycatcher's nest.

Occurring at all three breeding sites, parasitism varied greatly from year to year with an overall rate of 47% (Table 2). The rate may actually have been higher, given that parasitism may have been responsible for the failure of at least some of the seven nests whose cause of failure we could not determine. Parasitized nests were located closer to the edge of the habitat than unparasitized nests (Table 3). The number of successful flycatcher nests each year was inversely correlated with the number of nests parasitized (Pearson's $R^2 = 0.90$, $p < 0.02$). The success rate of parasitized nests was lower (12%, $n = 8$) than that of unparasitized nests (33%, $n = 9$). In the only parasitized nest that succeeded in fledging flycatchers, a cowbird egg was laid prior to the first flycatcher egg but had disappeared or was buried within the floor of the nest by the time the nest was next checked (12 days later) and contained only three flycatcher eggs. Flycatchers fledged a cowbird from one nest but never fledged both cowbirds and flycatchers from the same nest.

Vocalizations

Many flycatchers vocalized spontaneously throughout the season and were detected without the use of survey tapes. Breeding males sang most persistently before pairing and early in the nesting cycle, then sang less frequently once nesting was underway. Before pairing, male flycatchers sang the characteristic *fitz-bew* song at virtually any hour of day, as early as 03:05 and as late as 20:00 hrs. Early morning (prior to 05:00) song remained common throughout the nesting period, even into July. However, late in the breeding season, mated males with active nests often failed to sing after dawn, even in response to broadcast songs and calls. The pattern for unpaired males was much the same, except that they continued high song rates throughout the day later into the season. Nine of 28 (33%) of the migrants found over the course of this study were heard singing prior to the use of a survey tape at the site. Migrants accounted for up to 64% (mean 22 ± 26) of the spontaneously singing flycatchers detected each year.

At 09:10 on 23 May 1995, we were observing a female flycatcher that was 5 m from her nest while the territorial male was approximately 30 m away countersinging with a neighboring male. While both males were singing, the female began to sing a series of strong, loud *fitz-bews*. The structure and pattern of the female's *fitz-bews* were indistinguishable by ear from those typical of singing males. The female sang periodically over the next 40 minutes, giving a total of 58 *fitz-bews*, in bouts of 2 to 15 songs each. She usually sang while her mate and/or the adjacent male were singing and always while she was at or near the nest. At one point, she sang five times while sitting on the nest. Although we had heard what was suspected to be female flycatcher song in the canyon during other years, this is the only instance in which we could conclusively verify that it was the female singing.

DISCUSSION

Abundance and Distribution

The breeding population of the Willow Flycatcher in Grand Canyon continues to be localized and small. From 1992 to 1996, the flycatcher bred at three historic nesting sites, but they no longer breed at Lee's Ferry and RM 46 (last recorded in 1961 and 1987, respectively). During the course of our study, flycatchers stopped breeding at RM 71 (1994) but reestablished breeding at RM 50 (1993) and 51 (1994) following 1- to 2-year absences. Because of the dynamic nature of the establishment and loss of breeding sites, only one or two were occupied in any given year.

It is difficult to determine if the Willow Flycatcher's abundance in the Grand Canyon has changed over the last 15 years. If all of the singing flycatchers detected by Brown (1988, 1991) from 1982 to 1991 were breeding, then the population has declined considerably from a high of 11 pairs in 1986. However, our observations suggest that some of the flycatchers detected in Brown's less intensive surveys could have been migrants, floaters, unpaired males, or females, rather than breeding males. Our mean total number of flycatchers (combining migrants, floaters, and females) detected without the use of tape playback each year (5.0 ± 3.5, range 2–11) is not significantly different from Brown's 1982–1991 totals (mean 5.4 ± 3.4, range 2–11; t test, $t = 0.21$, $p = 0.8$). Apparently there is high annual variation and no clear population trend (Figure 5).

The best available indicators of trends in flycatcher breeding activity within the canyon are the number of verified breeding pairs and active nests found

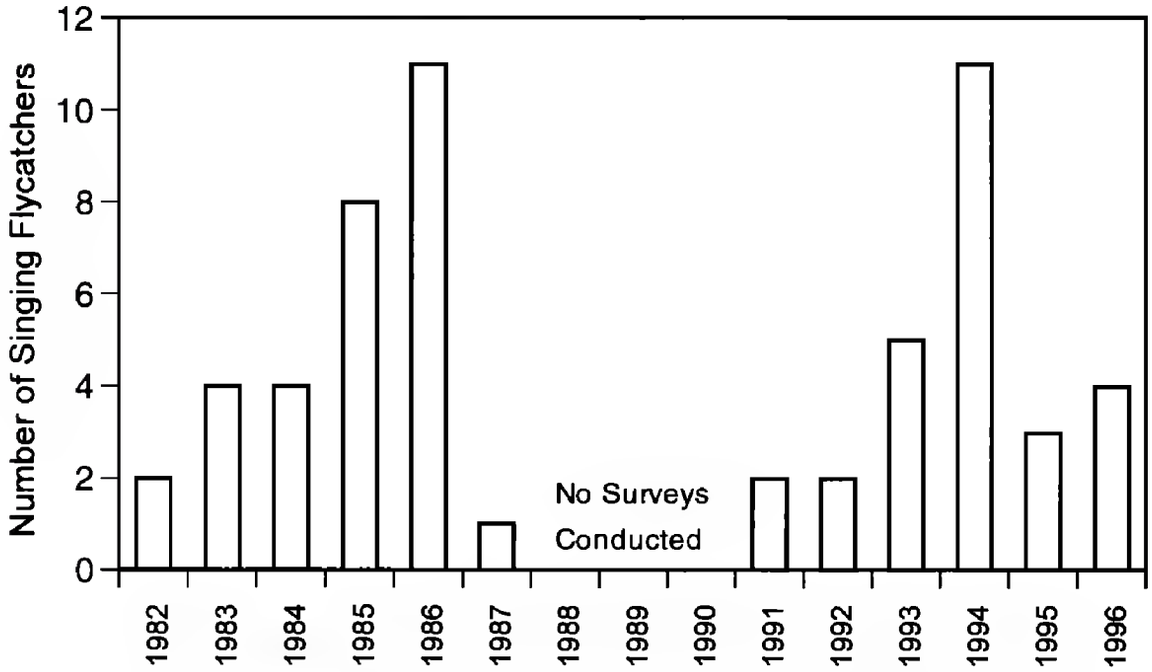

Figure 5. The number of singing Willow Flycatchers detected (without use of tape playback) in the Grand Canyon, 1982–1996. Data for 1982–1991 are from Brown (1988, 1991).

over time. C. M. White's specimens collected at Lee's Ferry provide evidence of only two breeding pairs at that site in 1961. In the 1970s, Carothers and Sharber (1976) noted only a single breeding pair per year. Even in the 1980s, when as many as 11 singing flycatchers were detected in one year (Brown 1988), the highest annual number of flycatcher nests found was only four (although this may be a function of Brown's less intensive survey effort). These historic numbers of breeding pairs and nests are similar to those found during our study.

Although *Empidonax* flycatchers are generally monogamous, polygyny occurs uncommonly among Willow Flycatchers in California (Whitfield 1990), Canada (Prescott 1986), Colorado, and Oregon (Sedgwick and Knopf 1989). Polygyny in the Grand Canyon appears to be similarly rare in that it was detected only once out of 18 established territories. In contrast, a large proportion (44%) of territorial males in the canyon were unpaired, approximately twice the estimated 20% of male *E. t. extimus* unpaired rangewide (Sferra et al. 1997, USFWS unpubl. data). The high proportion of unpaired males has contributed to the low productivity among flycatchers in the Grand Canyon since at least 1993.

The continued low population level makes the flycatchers susceptible to extirpation from the Grand Canyon by cowbird nest parasitism, natural attrition, or catastrophic events such as fire. Like most small migrant songbirds, Willow Flycatchers are relatively short-lived with an average adult lifespan of approximately 3 to 4 years (M. Whitfield, unpubl. data). Thus, if the flycatchers currently breeding in the canyon continue to produce few or no young for several breeding seasons, the older breeders that die are unlikely to be replaced. It is possible that Southwestern Willow Flycatchers from other areas could settle in the Grand Canyon area, given time and serendipitous dispersal. In fact, the canyon's population is probably not self-sustaining but composed (partially or primarily) of flycatchers immigrating from elsewhere. This hypothesis is supported by the increase in breeding pairs between 1993 (two pairs) and 1994 (four pairs), even though no young flycatchers were fledged in the canyon during 1993.

Breeding Ecology

Although Southwestern Willow Flycatchers were historically found primarily in willow–cottonwood and other native riparian tree and shrub associations (Phillips et al. 1964, Unitt 1987), the use of tamarisk as a nesting habitat is not unique to the Grand Canyon. Relatively large populations (approximately 20 pairs) currently inhabit tall, dense tamarisk-dominated habitats at two sites in central Arizona (Sferra et al. 1997). The tamarisk-dominated breeding sites in the Grand Canyon also include willow, cattail (*Typha latifolia),* and horsetail (*Equisetum*), which may be important habitat components. At other Arizona sites where willows and other native broadleaf vegetation dominate, flycatchers often place their nests in tamarisk even though other nest substrates are available (Sferra et al. 1997). This use of tamarisk contrasts sharply with documented loss of breeding flycatchers from areas such as the lower Colorado River and San Juan River, where tamarisk or other exotics have displaced the native broadleaf community (Unitt 1987, Rosenberg et al. 1991). One of the characteristics of occupied

tamarisk habitat in the Grand Canyon and elsewhere is that it is taller (usually >5 m) and denser (90% canopy closure; Sferra et al. 1997) than in areas where the flycatchers once bred but are no longer found.

Nest-placement characteristics at our sites are similar to those in other populations nesting in tamarisk, but nest height is greater than for flycatcher nests in native vegetation, particularly at higher elevations (Sferra et al. 1997). In tall, dense tamarisk stands the appropriately sized and oriented branches needed for nest placement are generally found in the upper portions of the plant, as reflected in the relationship that we found between nest plant height and nest height.

Vocalizations

Daily and seasonal song rate patterns followed those noted by Unitt (1987) and Brown (1991). During any part of the breeding season, males with active nests sometimes sang infrequently and did not respond to a tape-broadcast call, which has practical ramifications for survey design and timing. However, the persistence of very early morning (03:00–05:00) singing throughout the breeding season may provide surveyors with opportunities to detect resident flycatchers later in the season.

Song from females is not common among most passerines, although additional instances have been noted as attention to this phenomenon has increased (Catchpole and Slater 1995). Kroodsma (1984) first described female song in flycatchers injected with hormones. Seutin (1987) observed females singing in territorial defense in response to a broadcast tape of flycatcher song in their breeding territories. The nature and timing of the female song that we observed supports the interpretation that female Willow Flycatchers sing in a territorial aggression or defense context, as has been noted for several other *Empidonax* (MacQueen 1950, Kellner and Ritchison 1988). In fact, female song in Willow Flycatchers and other *Empidonax* may be much more common than currently recognized (Kellner and Ritchison 1988, Catchpole and Slater 1995). Females singing loudly and repeatedly (such as we observed) could easily be misinterpreted as territorial males, inflating estimates of the number of flycatcher territories at a site. Our intensive monitoring efforts minimized the potential for such misinterpretation in this study.

Brown-headed Cowbird Impacts

Cowbirds occur throughout Grand Canyon (Brown 1994, Johnson and Sogge 1995) and were seen at all flycatcher breeding sites. Approximately half of the flycatcher nests examined in the canyon during the 1980s were parasitized by cowbirds (Brown 1988, 1994), almost identical to our 47% parasitism rate for 1992 to 1996. This high rate of parasitism suggests that the flycatchers in the Grand Canyon are not effective in nest defense against cowbirds, despite our observations of aggressive interactions that could be interpreted as antiparasitic behaviors (Uyehara and Narins 1995). As demonstrated by Whitfield (1990) and Whitfield and Strong (1995) for flycatchers in southern California, cowbird parasitism in the Grand Canyon has clearly been a pervasive, long-term problem and may be the most

imminent direct threat to this breeding population of flycatchers (Sogge 1995).

Rothstein et al. (1984) and Cook et al. (1996) found that female cowbirds can travel up to 7 and 20 km, respectively, between areas where they parasitize nests in the morning then feed and/or roost later in the day. At the Grand Canyon, cowbirds concentrate at bird feeders and pack animal corrals along the south rim (Johnson and Sogge 1995, Drost 1996), within 4 to 6 km of the river and 10 km from the flycatchers' breeding site at RM 71. Drost (1996) recorded movements of color-banded cowbirds between feeding stations along the south rim averaging 19 km (range 5–8 km), suggesting that cowbirds foraging and roosting at the rim could readily reach flycatcher breeding sites along the river. In addition, livestock grazing (which attracts cowbirds) is common on adjacent Forest Service, Bureau of Land Management, and tribal lands, and cowbirds associate and forage with the Bison (*Bison bison*) herds at House Rock State Buffalo Ranch (Sogge, unpubl. data), approximately 16 km from the RM 50 site. Thus, many human-related activities provide cowbird concentration sites within commuting range of current (and potential) flycatcher breeding habitat in the canyon.

MANAGEMENT CONSIDERATIONS/IMPLICATIONS

The Southwestern Willow Flycatcher's endangered status, coupled with the small size, low productivity, and demographic instability of the population in the Grand Canyon, calls for continued monitoring and management along the Colorado River corridor. Human disturbance of the flycatcher's breeding areas in the Grand Canyon is likely because these areas are usually adjacent to sandy beaches, which are often popular camping sites. Flycatchers have bred for at least 10 years within approximately 100 m of popular camping areas such as the RM 71 site, suggesting that they are generally tolerant of low-level human activity that is not directly adjacent to or within the breeding territory. However, Taylor (1986) found a possible correlation between recreational activities and decreased riparian bird abundance, and Blakesley and Reese (1988) reported the Willow Flycatcher (probably *E. t. adastus*) as one of seven species negatively associated with campgrounds in riparian areas in northern Utah. Therefore, Grand Canyon National Park should continue to close public access to flycatcher sites during each breeding season to minimize disturbance and habitat degredation.

We also recommend that Grand Canyon National Park consider a cowbird control program. Such programs are effective at reducing cowbird parasitism at other flycatcher breeding sites (Whitfield and Strong 1995). Agencies and tribes that manage lands adjacent to the Grand Canyon should consider similar cowbird control efforts, especially around livestock grazing, horse and mule corrals, or bison ranches. Grand Canyon National Park should also take the lead in coordinating and developing an integrated Southwestern Willow Flycatcher management plan for the Colorado River corridor in the Grand Canyon. This plan would address near- and long-term flycatcher management and protection needs, and provide detailed recommendations, options, and tools to guide future flycatcher monitoring, research, and management.

The flycatcher surveyors and river guides worked incredibly hard under difficult field conditions—it was only through their excellent work that this project was a success. In particular, we thank Lawrence Abbott, Rob Marshall, Susan Sferra, and Brad Valentine for contributing their time, energy, and expertise to many years of surveys. Bryan Brown, Linda Sogge, Philip Unitt, and Mary Whitfield provided valuable reviews of an earlier draft of the manuscript.

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ABUNDANCE OF SHOREBIRDS AT WILLAPA BAY, WASHINGTON

JOSEPH B. BUCHANAN and JOSEPH R. EVENSON, Cascadia Research Collective, 218½ W. Fourth Avenue, Olympia, Washington 98501

There is a growing body of literature documenting large concentrations of shorebirds at wintering sites or migratory staging areas along the Pacific coast of North America. In the Pacific Northwest, such areas include the Fraser River delta (Butler 1994, Vermeer et al. 1994), Puget Sound (Buchanan 1988a, Evenson and Buchanan 1995), Grays Harbor (Herman and Bulger 1981), Willapa Bay (Widrig 1979), and beaches of the outer coast (Buchanan 1992). Some of these sites support numbers of shorebirds that qualify them as regionally or internationally important sites in the Western Hemisphere Shorebird Reserve Network (I. Davidson pers. comm.). Others comprise clusters of smaller sites that together support substantial numbers of birds (Evenson and Buchanan 1995). Identifying the role these sites play in supporting wintering and migrant shorebirds is an important step in developing conservation strategies to protect shorebirds and their habitats.

Prior research on shorebird use of Willapa Bay has been limited. At Leadbetter Point, Widrig (1979) conducted multiple shorebird surveys but only over a single year. Because shorebird abundance can vary both from year to year (Buchanan 1988a) and within a year (Evenson and Buchanan 1995), both intensive and long-term studies are essential for assessing population trends. The objective of this study was to estimate the abundance of shorebirds at Willapa Bay, Washington, to identify important candidate sites within Willapa Bay for future monitoring efforts. Here we present results of ground- and aerial-based counts of shorebirds during winter, spring, and autumn from 1991 to 1995 that document this site as among the most important to shorebirds on the west coast of North America.

STUDY AREA

Willapa Bay is on the outer coast of Washington state between Grays Harbor and the Columbia River mouth. It covers about 420 km^2 and is fed by the Cedar, North, Willapa, and Palix rivers in the north and the Nemah, Naselle, and Bear rivers in the south (Figure 1). A long, narrow peninsula (North Beach Peninsula) dominated by low dunes, pastures, and woodlands separates the main body of the bay from the Pacific Ocean. Of the several salt marshes around the bay, the largest are at the mouths of the Willapa River to the north and the Bear River to the south. Low tide (0.0 m) exposes about 200 km^2 of mud flats. Numerous sand shoals are exposed during all but the highest tides; there are no dredge-spoil islands in the bay. Two areas, Leadbetter Point and the Bear River/Lewis Unit flat, are within Willapa National Wildlife Refuge.

METHODS

Our counts involved a combination of aerial and ground-based efforts. Because Willapa Bay is large and access to many areas is limited, surveying

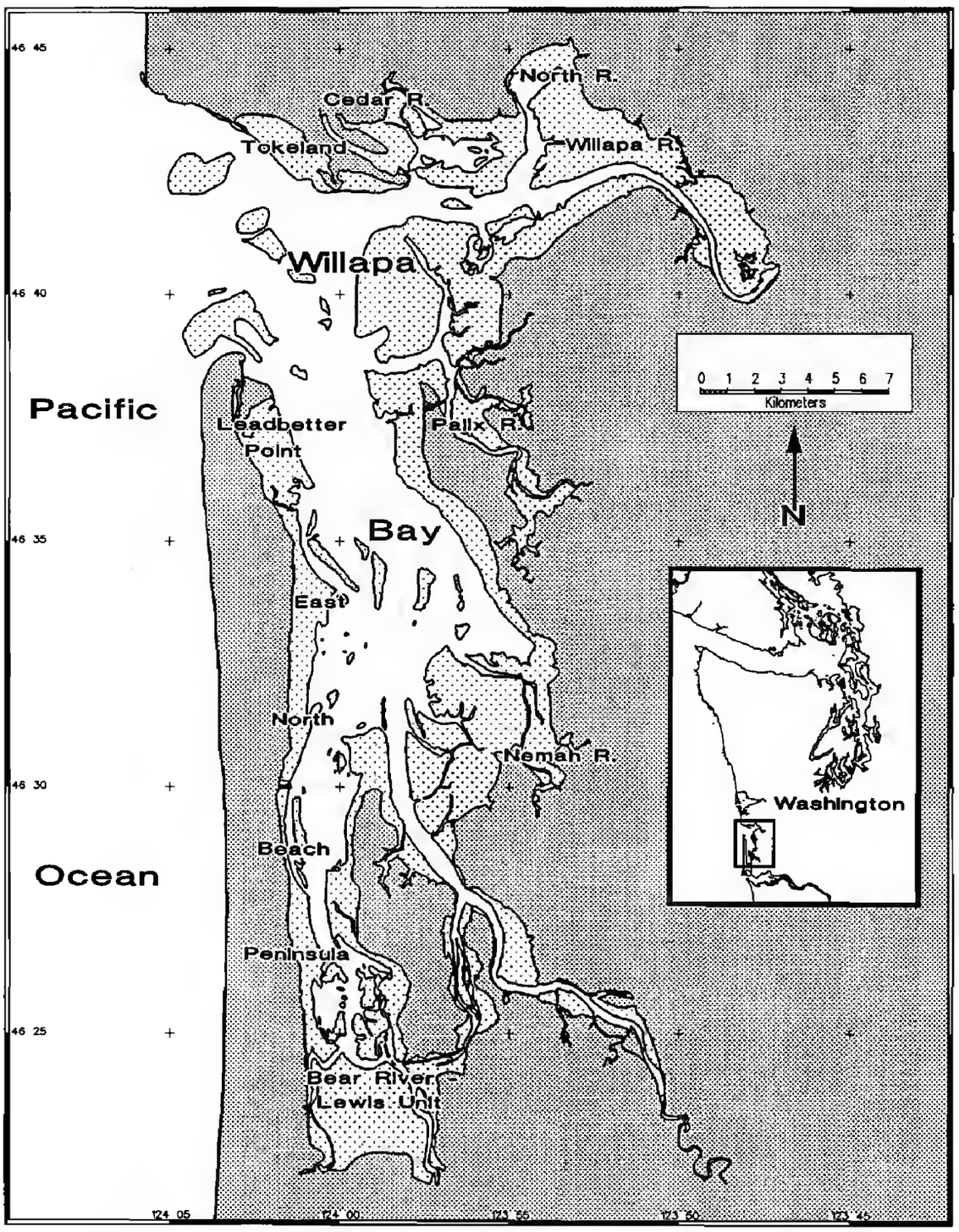

Figure 1 Willapa Bay, showing the location of sites covered by ground and aerial surveys for shorebirds between 1991 and 1995. Light stippling, intertidal foraging and roosting habitats.

shorebirds adequately from the ground is difficult. For this reason, on each survey we made counts from a small airplane flying at a height of about 60 to 70 m. These aerial counts were the basis of our primary estimates of shorebird abundance in the estuary. We also made aerial counts of birds (primarily Sanderlings) on outer North Beach on five occasions; the beach covered by the counts was 37 km long.

Ground counts were made by a total of 18 observers (median 5 per seasonal count) who counted shorebirds at eight primary sites: Tokeland, Cedar River, North River, Willapa River, Palix River, Bear River/ Lewis Unit, East North Beach Peninsula, and Leadbetter Point. Ground counts were used to estimate the proportions of species not identified from the air. Thus, depending on the season, ground observers determined the species composition of groups of look-alike species, including the Greater and Lesser yellowlegs; Whimbrel, Marbled Godwit, and Long-billed Curlew; Western Sandpiper, Least Sandpiper, and Dunlin; and Red Knot and dowitchers. Proportions derived from ground counts of particular sites or regions of the bay were applied to the corresponding unidentified species groups from aerial counts of these regions, then regional totals were summed to provide baywide estimates. Aerial counts alone were used to estimate populations of the Black-bellied Plover. Ground counts alone were used for all other species, which consequently were underestimated because of partial coverage of the bay by this method.

Because the main objective of these counts was to identify important sites for future monitoring efforts, they were usually made only once each season (Table 1). Counts were made during rising or falling tides generally within four hours of high tide. The logistical constraints noted above necessitated conducting the ground counts at sites where shorebirds aggregated immediately prior to and/or after high tide. Consequently, aerial counts covered the entire shoreline whereas ground counts covered only the areas of major concentrations of birds. Our scheduled flights were occasionally postponed

Table 1 Dates of Shorebird Counts at Willapa Bay, Washington, 1991–1995

Aerial	Ground
Winter[a]	
28 Nov 1992	21–22 Nov 1992
4 Dec 1993	22 Nov–4 Dec 1993
31 Dec 1993	28–29 Dec 1993
21 Dec 1994	21–30 Dec 1994
9 Feb 1995	28 Jan–9 Feb 1995
Spring[b]	
27 Apr 1991	27 Apr 1991
27, 30 Apr 1993	25 Apr–1 May 1993
26 Apr, 1 May 1994	28, 30 Apr 1994
Autumn	
30 Aug 1993	15–20 Aug 1993

[a]Two complete (aerial and ground) counts were conducted in the winters of 1993-94 and 1994-95.

[b]Two flights were made in the springs of 1993 and 1994; each pair of flights coincided with a single ground count.

because of adverse weather conditions, and therefore some ground counts during winter and spring were not made on the same day as the aerial counts. Nonetheless, we believe that the estimates of the proportions of species derived from these counts are reliable because the number of species during winter was low and did not vary appreciably within the bay, and most ground counts in spring were made on or within two days of the aerial counts.

RESULTS AND DISCUSSION

Species Accounts

Black-bellied Plover (*Pluvialis squatarola*). This was the second most numerous species in winter in all three years and generally the fourth most numerous species during migration (Tables 2 and 3). The total of 4049 counted on 21 December 1994 included 3848 roosting on outer North Beach at high tide, the highest known winter count at a single site in Washington state (Paulson 1993).

Semipalmated Plover (*Charadrius semipalmatus*). The irregularity of this species in Washington in winter (Buchanan 1992) is reflected in our results (Table 3). The Semipalmated Plover is locally distributed in all seasons.

Killdeer (*Charadrius vociferus*). The Killdeer was observed in low numbers in all seasons (Table 3). Widrig (1979) saw very few Killdeers at Leadbetter Point during any season.

Greater Yellowlegs (*Tringa melanoleuca*). The Greater Yellowlegs is a regularly occurring winter resident in estuarine habitats in the Pacific Northwest (Buchanan

Table 2 Seasonal High Counts of Black-bellied Plovers, Dunlins, Western Sandpipers, and Short-billed Dowitchers at Primary Census Sites in Willapa Bay, 1991–1995

	Winter		Spring			
Site	Black-bellied Plover	Dunlin	Black-bellied Plover	Dunlin	Western Sandpiper	Short-billed Dowitcher
Tokeland	415	2,320	35	832	3,603	300
Cedar River	67	450	8	756	4,844	1,780
North River	240	3,915	100	1,890	12,110	5,190
Willapa River	5	13,510	100	2,970	16,830	12,460
Between Willapa R. and Palix R.	6	3,120	180	2,481	14,059	2,345
Palix River	35	8,800	84	1,191	6,749	4,380
Between Palix R. and Nemah R.	15	2,160	85	2,586	10,344	1,465
Nemah River	205	8,150	300	2,400	9,600	4,000
Bear River	210	27,260	300	12,300	36,900	5,000
E. North Beach peninsula	50	5,115	65	2,554	3,831	680
Leadbetter Point	54	3,935	125	7,930	5,070	4,425

Table 3 Numbers of Shorebirds Counted or Estimated at Willapa Bay, Washington, 1991–1995

	Winter			Spring			Autumn
Species	1992–93	1993–94	1994–95	1991	1993	1994	1993
Black-bellied Plover[a]	415	881	4,049	918	653	245	205
Semipalmated Plover[b]	12	0	0	27	122	264	98
Killdeer[b]	0	6	1	0	0	2	4
Greater Yellowlegs[c]	84	42	97	40	160	275	65
Lesser Yellowlegs[d]	0	0	0	0	1	0	2
Willet[b]	0	0	0	0	0	0	5
Spotted Sandpiper[b]	0	0	3	0	0	1	1
Whimbrel[d]	4	9	3	0	82	27	229
Long-billed Curlew[d]	0	67	70	0	8	1	0
Marbled Godwit[d]	0	303	462	0	115	51	70
Large sandpiper spp.	0	0	0	150	0	0	0
Ruddy Turnstone[b]	0	2	0	0	2	2	0
Black Turnstone[b]	28	26	29	1	0	7	1
Red Knot[b]	0	0	0	0	177	1	0
Sanderling[d]	372	135	16	0	0	6	2
Western Sandpiper[d]	80	[e]	258	82,575	55,195	49,615	8,976
Least Sandpiper[d]	0	22	235	1	[e]	150	374
Dunlin[d]	47,017	69,850	27,120	7,525	29,720	41,640	0
Long-billed Dowitcher[b]	50	94	61	0	0	0	0
Short-billed Dowitcher[d]	0	0	0	23,865	8,900	16,595	153
Dowitcher spp.[b]	0	0	0	0	0	0	31
Common Snipe[b]	10	2	0	0	1	1	0

[a]Direct aerial count of the entire bay.

[b]Number counted from the ground only; total for some species may under-represent actual number of birds present.

[c]Direct aerial count of the entire bay unless ground count revealed Lesser Yellowlegs, in which case proportional counts were used.

[d]Number projected from proportions of similar species counted during surveys on the ground (see Methods).

[e]Present but not counted.

1988b). The count from winter 1994–95 appears to be the highest winter count yet made in the region (Table 3; Paulson 1993, Buchanan unpubl. data).

Lesser Yellowlegs (*Tringa flavipes*). The only survey observations were of one bird in spring 1993 and two in autumn 1993 (Table 3). Widrig (1979) noted this species at Leadbetter Point only during autumn migration, whereas (Herman and Bulger 1981) found small numbers at Grays Harbor during spring.

Willet (*Catoptrophorus semipalmatus*). The five Willets at Cedar River in autumn 1993 were the only ones recorded on our surveys (Table 3). By contrast, Willets were observed fairly regularly at Willapa Bay during winter in years prior to our counts (Paulson 1993), though Widrig (1979) noted this species at Leadbetter Point only during autumn migration.

Spotted Sandpiper (*Actitis macularia*). Spotted Sandpipers were observed on single winter, spring, and autumn counts (Table 3), a pattern similar to that noted by

Table 4 Seasonal High Counts of all Shorebird Species at Primary Census Sites in Willapa Bay, 1991–1995

Site	Winter	Spring	Autumn
Tokeland	2,447	4,530	494
Cedar River	450	6,360	150
North River	4,099	19,200	2
Willapa River	13,510	22,665	60
between Willapa R. and Palix R.	3,122	16,540	0
Palix River	8,800	9,000	2,099
between Palix R. and Nemah R.	2,307	14,495	1,690
Nemah River	8,358	16,000	—
Bear River/Lewis Unit	27,470	54,450	2,403
East North Beach Peninsula	5,119	6,465	57
Leadbetter Point	3,971	13,000	6,270

Widrig (1979) at Leadbetter Point and by Herman and Bulger (1981) at Grays Harbor during spring migration.

Whimbrel (*Numenius phaeopus*). The Whimbrel occurred primarily as a spring and autumn migrant with smaller numbers overwintering (Table 3). Widrig (1979) likewise reported it as a migrant at Leadbetter Point but did not record the species during winter. We observed Whimbrels only in the northern part of Willapa Bay (including Leadbetter Point), mostly at sites on the western shore. Herman and Bulger (1981) found Whimbrels most numerous in Grays Harbor in mid-May.

Long-billed Curlew (*Numenius americanus*). The Long-billed Curlew was observed during two winter and two spring counts (Table 3). In all seasons, it was generally found only in the northernmost part of Willapa Bay. At Leadbetter Point, Widrig (1979) recorded only a few Long-billed Curlews in spring.

Marbled Godwit (*Limosa fedoa*). We observed larger flocks of Marbled Godwits in the winters of 1993–94 and 1994–95 than during migration periods (Table 3). In all seasons, nearly all godwits were seen at Cedar River, North River, Tokeland, and Willapa River. We have no information to explain this localized distribution. At Leadbetter Point, Widrig (1979) observed no Marbled Godwits in winter and very low numbers in other seasons. Wintering numbers of Marbled Godwits in northern Willapa Bay may have increased between the early 1980s and the 1990s; counts of >100 were unusual during the earlier period (C. Chappell pers. comm.).

Ruddy Turnstone (*Arenaria interpres*). Two Ruddy Turnstones were found on a single winter and on two spring surveys (Table 3). Spring numbers may have been low because our surveys were conducted prior to the early May peak of movement of Ruddy Turnstones in this region (Paulson 1993).

Black Turnstone (*Arenaria melanocephala*). We noted very similar numbers of Black Turnstones during each of the three winters, lower counts during migration (Table 3). Black Turnstones were observed at the town of Nahcotta on the East North Beach Peninsula. Herman and Bulger (1981) recored very few Black Turnstones at Grays Harbor during spring migration.

Red Knot (*Calidris canutus*). The Red Knot occurred only in spring migration and the number of birds counted annually was quite variable (Table 3). The counts at Willapa Bay were much lower than those from Grays Harbor, where several thousand

birds were noted by Herman and Bulger (1981). However, our spring counts there were conducted prior to the primary passage of Red Knots in this region (Paulson 1993).

Sanderling (*Calidris alba*). We regularly recorded Sanderlings each winter within the bay, but few during migration (Table 3). On outer North Beach we made three aerial counts in winter [mean 50.1 birds/km, standard deviation (SD) 6.5] and single counts during spring (78.6/km) and autumn (213.5/km). Our counts there were comparable to those made on the same beach in the winters of 1982 to 1990 (mean 46.6, SD = 14.5; Buchanan 1992) and in spring 1983 (94 birds/km.; Myers et al. 1984).

Western Sandpiper (*Calidris mauri*). Western Sandpipers were recorded each winter, although they were far more abundant during migration (Table 3). There was considerable variation among spring counts, possibly related to the timing of our counts relative to the actual peak passage.

Least Sandpiper (*Calidris minutilla*). We recorded small numbers of this species on nearly all counts (Table 3). The Least Sandpiper has a local distribution in Washington during winter.

Dunlin (*Calidris alpina*). The Dunlin was by far the most numerous species during winter (Table 3), when it constituted 85.6% to 97.9% of all shorebirds and 98.7% to 99.8% of all *Calidris* sandpipers. This is within the range of dominance noted in the greater Puget Sound region (Evenson and Buchanan 1995, Buchanan 1988a) and in an earlier study on North Beach (adjacent to Willapa Bay; Buchanan 1992). The Dunlin was the second most abundant species during spring migration (Table 3), a pattern observed at Leadbetter Point (Widrig 1979) and at Grays Harbor (Herman and Bulger 1981).

Short-billed Dowitcher (*Limnodromus griseus*). The Short-billed Dowitcher occurred primarily in spring, when it was the third most numerous species (Table 3). It was also observed during autumn but not in winter.

Long-billed Dowitcher (*Limnodromus scolopaceus*). We recorded the Long-billed Dowitcher by vocalizations in all three winters (Table 3), when it is generally the only species of dowitcher found in Washington (Buchanan 1992, Paulson 1993). We did not record this species in spring, although it is likely that it was present then each year. Similarly, Widrig (1979) found that *L. scolopaceus* constituted only about 1% of all dowitchers at Leadbetter Point in May.

Common Snipe (*Gallinago gallinago*). Recorded on only two winter and two spring counts (Table 3).

Seasonal Abundance of Shorebirds

The total abundance of shorebirds varied considerably from winter to winter. The variation in counts largely reflected variation in the abundance of the Dunlin (mean 47,996, SD = 21,382; Table 3). This approximate range of annual variation in abundance has been documented in other studies in coastal Washington (Buchanan 1992) and Puget Sound (Buchanan 1988a, Evenson and Buchanan 1995). It is currently unclear whether the variation in winter counts was related to factors in breeding areas, nonbreeding areas, or both.

Among the spring counts, we noted similar variation that was primarily related to the abundance of Western Sandpipers (Table 3). We believe it is likely that differences among spring counts may have been due to the timing of surveys relative to the peak passage of spring migrants.

We observed within-season variation in total shorebird numbers in one of the two years in which we conducted multiple counts; our aerial count of 49,400 on 4 December 1993 was much lower than the estimate of 70,650 on 31 December 1993. Substantial changes in the within-season abundance of shorebirds also have been noted at several major sites in Puget Sound (Evenson and Buchanan 1995) but not at two smaller sites there (Buchanan 1988a). At Puget Sound sites the changes in abundance were thought to be primarily related to both regular movement among a network of sites and larger-scale movements in response to adverse weather (Evenson and Buchanan 1995). It is possible that shorebirds regularly move between Willapa Bay and Grays Harbor (16 km to the north) or the Columbia River estuary (6.5 km to the south). Although we were unable to document such movements, shorebirds are known to travel these distances in western Washington (Evenson and Buchanan 1995) and elsewhere (Warnock et al. 1995).

Adverse weather conditions are known to influence the seasonal distribution and abundance of shorebirds (Warnock et al. 1995). It is possible that the relatively low counts in winter 1994–95 were a response to mid-winter flooding at Willapa Bay. Both counts that year were made during a period of severe storms. We noticed that certain channels and flats in the bay were visibly altered between counts by scouring. In addition, flood tides inundated many foraging and roosting areas for longer than usual.

Important Areas

The importance to shorebirds of various sites in an area can be measured by the ability of sites to meet the energetic demands of overwintering or migrant birds (Goss-Custard 1984) or to support large numbers of individuals. This study was not designed to determine the energetics of shorebirds, but did provide preliminary data on the seasonal abundance of shorebirds at various sites within Willapa Bay.

Our results indicate greater total abundance of shorebirds at the Bear River/Lewis Unit and Willapa River in the winter and spring (Tables 2, 4). From the air, however, we noted that shorebirds used much of the intertidal area of the bay before congregating at the major sites when less than about 5% of the mud flats in the bay were still exposed. Emphasizing concentrations of birds at specific sites is appropriate but it is crucial to recognize the importance of the other areas used by shorebirds at other stages of the tidal cycle.

Our census efforts indicated that in all seasons some shorebird species were concentrated at specific sites or within certain regions of the bay. For example, in all seasons the Willet, Long-billed Curlew, and Marbled Godwit were observed only at sites in the northern part of the bay, primarily Tokeland, Cedar River, and North River. Other species with very local distributions included the Whimbrel (in all seasons mostly at Tokeland, North Cove, Leadbetter Point), Black Turnstone (in all seasons at Nahcotta on East North Beach Peninsula), Red Knot (in spring in the northern portion of the bay), Least Sandpiper (in winter primarily at East North Beach Peninsula, Leadbetter Point, Tokeland), Long-billed Dowitcher (in winter primarily at Bear River/Lewis Unit), and Common Snipe (in winter at Bear River/Lewis Unit, Willapa River).

Among the sites important to shorebirds are those used for roosting, where they preen and rest during high tides. At Willapa Bay shorebirds roosted primarily in salt marsh, pastures, on islands, and on the outer beach. Our highest count of roosting birds was from the outer North Beach in spring (about 28,500 shorebirds, including several thousand Sanderlings, on 30 April 1993). Large numbers of shorebirds roost there in winter as well (about 34,600, not including Sanderlings; Buchanan 1992). We also observed several thousand spring migrant shorebirds roosting in pastures and agree with Colwell and Dodd (1995) that pastures may be important habitats for roosting shorebirds.

Willapa Bay and the Pacific Flyway

The Western Hemisphere Shorebird Reserve Network has proposed standards for ranking the importance of sites to shorebirds. Sites that support >20,000 shorebirds or 5% of a flyway population are considered regionally important, whereas sites that support >100,000 shorebirds or 15% of a flyway population are considered internationally important (I. Davidson pers. comm.). Willapa Bay meets the criteria of an internationally important site because it supports up to 15.5% of the Pacific flyway population of wintering Dunlins (derived from Page and Gill 1994) and an average of over 100,000 total shorebirds in spring. Willapa Bay's importance indicates it is a prime site for future shorebird monitoring and conservation efforts in the Pacific Northwest.

Conservation Issues

A current issue of conservation significance at Willapa Bay is the occurrence of the exotic and invasive cordgrass *Spartina alterniflora*. This salt-marsh plant appears to have spread rapidly in recent years, and in 1992 covered about 809 ha of the intertidal area of the bay (Washington Department of Agriculture et al. 1993). This species colonizes bare tideflats, traps sediments, and displaces low intertidal salt-marsh plants. Consequently, the invasion of *Spartina* will likely have a negative effect on shorebird populations by reducing foraging habitat (Goss-Custard and Moser 1988). Efforts are currently underway to control the spread of, and eventually eliminate, this exotic species.

SUMMARY

We conducted seasonal censuses of shorebirds at Willapa Bay, Washington, between 1991 and 1995. The census was designed to identify the location of potentially important sites for future monitoring efforts. The Dunlin was the most abundant species in winter, with annual total counts ranging between 27,120 and 69,850 birds. The Western Sandpiper was the most abundant species during spring; our annual counts ranged between 49,615 and 82,575. Dunlins and Short-billed Dowitchers were also abundant during spring and contributed to annual spring counts that exceeded 100,000 total shorebirds. Two estuarine areas within the bay, Willapa River and Bear River–Lewis Unit, typically supported the highest seasonal counts at higher tides, but shorebirds were well distributed along much of the

shoreline of the bay on rising and falling tides. Willapa Bay is an internationally important site for overwintering and migrating shorebirds.

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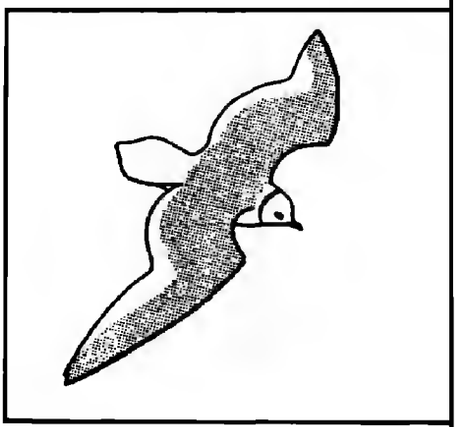

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NOTES

HYBRIDIZATION OF A SANDWICH AND ELEGANT TERN IN CALIFORNIA

CHARLES T. COLLINS, Department of Biological Sciences, California State University, Long Beach, California 90840

The Sandwich Tern (*Sterna sandvicensis*) is a widespread breeding species on the Atlantic coasts of Europe and North America (AOU 1983, Cramp 1985) and the Caribbean (AOU 1983). On the Pacific coast it winters south to Colombia (Hilty and Brown 1986), Ecuador (Ridgely 1981), and Peru (Junge and Voous 1955, Harrison 1983). Although the Sandwich Tern is a "common transient and winter resident" in Panama (Ridgely 1981), it is decidedly less common farther south. Sandwich Terns also occur sparingly in winter northward on the Pacific coast of Central America as far as Oaxaca, Mexico (Peterson and Chalif 1973, AOU 1983). Since there are no recorded breeding colonies on the Pacific coast it is assumed that all Sandwich Terns on the Pacific coast of Central and South America represent wintering migrants from Atlantic or Caribbean colonies. The recovery in Buenaventura, Colombia, of a Sandwich Tern that had been banded in a breeding colony in North Carolina (Hilty and Brown 1986) supports this view.

In California, the Sandwich Tern is considered "accidental" (Unitt 1984) or "exceedingly rare" (Small 1994); as argued below, all records may pertain to only two individuals. The first Sandwich Tern in California was observed in May 1980 on the dikes around salt-evaporation ponds in south San Diego Bay near Imperial Beach (McCaskie 1980, Schaffner 1981, Luther et al. 1983). This bird was seen with a fish in its bill, approaching Elegant Terns (*Sterna elegans*) nesting there. It was in the typical stance of a male courting a female. In all cases observed, this presumed male was driven off by the Elegant Terns (Schaffner 1981). What was considered to be the same individual was seen in San Diego Bay 15 May–13 June 1982 (McCaskie 1982a,b, Morlan 1985), 12–14 June 1985 (Bevier 1990), and 18 April–16 May 1987 (Langham 1991). There was no suggestion of breeding by this Sandwich Tern in any year, and it was not seen again after 1987.

On 20 May 1991 an adult Sandwich Tern was observed at Malibu Lagoon, Los Angeles County, by Barbara Elliott (pers. comm.). A single Sandwich Tern also was observed on 29 June 1991 among nesting Elegant Terns at Bolsa Chica Ecological Reserve, Orange County, by Brian Daniels and Doug Willick (pers. comm.). The bird observed at Malibu Lagoon was reported to be in alternate plumage and the one at Bolsa Chica in basic plumage, suggesting to some that two individuals were present in 1991 (Patten et al. 1995). The Malibu bird was described as having a cap "black from bill to nape" (Elliott in litt.), typical of an alternate-plumaged adult. The Bolsa Chica bird "showed a considerable amount of white [on the head] especially anteriorly" (Willick in litt.), as was also true of many of the Elegant Terns on this date. This indicates the start of the prebasic molt; the bird was not in the full basic plumage. The interval between these separate observations (40 days) was more than sufficient for the prebasic molt to have begun and for many of the black forehead feathers to have been replaced by white ones, as observed in many Elegant Terns by this date (pers. obs., Figures 1–2). Thus, I agree with McCaskie (1991), who suggested that the Sandwich Terns seen at Malibu and Bolsa Chica in 1991 were the same individual.

At Bolsa Chica on 24 June 1995 my attention was drawn by Robert Schallmann and Tom Ryan to a tern with a yellow-tipped black bill among the Elegant Terns nesting there. Closer examination showed that not only was it an adult Sandwich Tern but it was attending a nest. While we watched at ranges of <20 feet, this bird was seen

Figure 1. Adult Sandwich Tern in Elegant Tern nesting colony, Bolsa Chica Ecological Reserve, 24 June 1995.

Photo by Charles T. Collins

Figure 2. Adult Sandwich Tern attending its chick, Bolsa Chica Ecological Reserve, 24 June 1995.

Photo by Charles T. Collins

Figure 3. Adult Sandwich Tern agressively defending nest at Bolsa Chica Ecological Reserve, 24 June 1995.

Photo by Charles T. Collins

actively defending the nest and brooding a chick <6–7 days old. At one point during our observations it engaged in a series of non-aggressive interactions and nest exchange with a typically plumaged Elegant Tern, suggesting they were mated. I returned to the colony about one-half hour later and photographed this tern while it was standing (Figure 1), brooding the chick (Figure 2), and threatening adjacent nesting Elegant Terns (Figure 3).

As shown in Figure 1, this Sandwich Tern appeared to be in the definitive alternate plumage but with a partially white forehead indicating the early stages of the prebasic molt; many Elegant Terns were in the same stage of molt on this date (Figures 1–2) as was the Sandwich Tern seen here in 1991. Accompanied by M. San Miguel and S. L. Warter, I returned on 25 June to color-band the chick for future identification. However, by then the chicks in that part of the colony were leaving the nest scrapes to form a crêche, and the hybrid chick could not be separated from the others. Chicks of Elegant Terns are highly variable in color of both plumage and soft parts, making identification of the similarly colored hybrid chick impossible. The Sandwich Tern was observed a few meters away from where it was seen on the previous day but not associated with a particular nest or chick. A Sandwich Tern, presumably this single individual, was seen by many observers over the next several weeks and last seen 17 July by J. Sterling (Hamilton and Willick 1996). Never was more than one Sandwich Tern seen at the same time.

Terns are long lived (Cramp 1985), and a hybrid pair in England has survived for 11 seasons (Gillon and Stringer 1994). Thus there was ample reason to suspect the Sandwich Tern would return to Bolsa Chica in 1996. I attempted to locate it on a nest in May and early June but was unsuccessful despite careful observation on several occasions, including close scrutiny of nesting groups from a blind. Nonetheless, a Sandwich Tern was seen on the edge of the colony on 15 June 1996 (B. Broadbooks

pers. comm.) and again on 20 June 1996. A Sandwich Tern has also been seen in the Bolsa Chica colony on several days in May 1997 (D. Willick pers. comm.) and located incubating an egg in this colony on 14 June 1997 (C. Collins, H. Clarke, L. Sansone pers. obs.)

The 1980 observations were of a presumed male Sandwich Tern on the basis of its unsuccessful courtship behavior. This suggests that the successful pairing at Bolsa Chica in 1995 may have been the reverse situation, a female Sandwich Tern mated to a male Elegant Tern. In a similarly successful hybrid pairing between a Sandwich and Lesser Crested Tern (*Sterna bengalensis*), the out-of-range individual was also a female (Gillon and Stringer 1994).

The number of Elegant Terns nesting at Bolsa Chica has increased dramatically from about 1100 pairs in 1991 (Collins et al. 1991) to approximately 4000 pairs in 1995 and 3400 pairs in 1996 (pers. obs.). Accordingly, it seems possible that this tern could have been present prior to 1995, when it was not even suspected to be present and thus not carefully looked for, among the many Elegant Terns nesting there. My failure to locate the Sandwich Tern on a nest in 1996, even when looking for it carefully, suggests that it could have been present, but overlooked, from 1992 to 1994. I think it is possible that the Sandwich Tern observed from 1995 to 1997 is the same individual first observed in 1991 and could have been breeding in the summers of 1992–1994. If so, this would account for several possible hybrid individuals observed on the California coast from 1995 to 1997 (B. Daniels, P. Cole pers. comm., pers. obs.), including one at the Pajaro River mouth, Santa Cruz/Monterey County line, 4–11 July 1995 (Yee et al. 1995, S. M. Bailey in litt.).

The apparent male observed in San Diego 1980–1987 and the presumed female at Bolsa Chica 1991–1996 may be the only two Sandwich Terns recorded thus far in California. The Bolsa Chica individual also represents the first record of a Sandwich Tern breeding in California or on the Pacific coast of the Americas. Hybridization between other closely related species of crested terns has been previously reported (Gillon and Stinger 1954). Both first-generation (F_1) hybrids and possibly also second-generation hybrids (back crosses) of the Bolsa Chica pair may occur and thus enliven summer tern watching on the coast of California in the years to come.

I am grateful to R. Schallmann and T. Ryan for first calling my attention to the Sandwich Tern in 1995, to the numerous individuals who have helped with the tern studies at Bolsa Chica over the years, and to T. Kelly for making these studies possible. B. Elliott, B. Daniels and D. Willick kindly provided copies of field notes detailing their observations of the 1991 bird. R. A. Hamilton, M. San Miguel, S. M. Bailey and P. Unitt made helpful comments on an earlier draft of this manuscript.

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SNOWY PLOVER NESTING ON EEL RIVER GRAVEL BARS, HUMBOLDT COUNTY

DONALD C. TUTTLE and RICHARD STEIN, Department of Public Works, Natural Resources Division, 1106 Second Street, Eureka, CA 95501

GARY LESTER, 2310 Hewitt Road, McKinleyville, CA 95519

The Pacific coast population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*) nests typically on sand spits, dune-backed beaches, around estuaries, and on beaches at river mouths. Less common nesting habitat includes saltpans, dredge-spoil disposal sites, dry salt ponds, and salt-pond levees (Miller 1993). In northwestern California, it has been considered mostly restricted to sandy ocean beaches, rarely occurring on gravel bars of the lower Eel River upstream nearly to Fernbridge, 6 miles inland (Harris 1991).

On 24 May 1996, we observed four adult plovers foraging on a gravel bar of the lower Eel River known locally as the Worswick Gravel Bar, about 4000 feet upstream of the bridge at Fernbridge. On 10 June 1996, we found an adult male and two chicks on another gravel bar of the lower Eel River approximately 1000 feet downstream of the same bridge (Figures 1 and 2). Subsequently we discovered three nests with eggs on the Worswick Bar, on 20 June, 26 June, and 6 July 1996. The first and last nests were 1400 feet apart and each contained three eggs. The second nest was about 130 feet from the first and contained one cracked egg.

The substrate of the gravel bar ranges from fine silt and sand to a mixture of sand and pebbles to a mixture of rounded stones and cobbles. The first two nests were in areas of sand and pebbles 500 feet inland from the water's edge. The third was 80 feet from the water's edge in an area of rounded stones and cobbles, covered with a thin layer of fine silt (Figures 3 and 4). Our last observation of the birds on the Worswick Bar was on 14 August 1996.

Our observations during the summer of 1996 suggest that at least eight adult Snowy Plovers established at least four nests and hatched eight chicks on the gravel bars near Fernbridge. In comparison, Gary Page (pers. comm.) estimated the 1996 population of the entire 71 miles of Humboldt County's coastline at 15 adults.

Figure 1. Adult male Western Snowy Plover on Eel River gravel bar, 10 June 1996.

Photo by Gary Lester

Figure 2. Western Snowy Plover chick on Eel River gravel bar, 10 June 1996.

Photo by Gary Lester

The nesting of these birds at a straight-line distance of 7 miles from the nearest ocean beach represents a departure from their usual nesting sites, which have not been reported along the Pacific coast along rivers more than 0.5 mile upstream from their mouths (Page pers. comm.). Of course, the species nests widely around inland lakes.

Following the discovery of plovers near Fernbridge, surveys were extended 4 miles upstream to the mouth of the Van Duzen River and 1 mile downstream of Fernbridge. Plovers were observed on four bars upstream and two bars downstream of the Worswick Bar. The maximum number observed at one time on any bar was eleven (Ron LeValley unpubl. notes).

Other rivers in Humboldt County were not systematically surveyed because of lack of staff and funding. The gravel beds of Redwood Creek and the Mad, Van Duzen, and Mattole rivers are fairly narrow (200 to 300 feet) except in their lower reaches (1.5 to

Figure 3. Western Snowy Plover nest with eggs on Worswick Bar, 20 June 1996. Substrate is mixture of sand and small rocks.

Photo by Donald Tuttle

Figure 4. Western Snowy Plover nest with eggs on Worswick Bar, 6 July 1996. Substrate is mixture of small rocks and cobbles.

Photo by Donald Tuttle

3 miles) and a 3-mile section of the Mad River located 4–8 miles inland (the unvegetated portion, however, is only about 200 feet wide). The lowest 1.5-mile section of the Van Duzen was surveyed; no plovers were observed. The Eel River bed near Fernbridge is 1200 to 1400 feet wide. The unvegetated gravel bar at Worswick is about 600 feet wide and 2000 feet long.

The plovers nested on the Worswick Bar despite frequent human disturbance, evidenced by tracks of four-wheel-drive vehicles and empty shotgun shell casings, and the presence of predators such as ravens, gulls, and raccoons. We recorded noise levels of the traffic on Highway 101 (1000 feet east) and the County of Humboldt's portable rock crusher (600 feet northeast) adjacent to the first and third nests. At 50 to 60 dBA (decibels on the A scale) this noise had no observable effect on plover behavior and did not inhibit nesting.

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SOME OBSERVATIONS OF BIRDS ON THE CENTRAL MEXICAN PLATEAU

TONY LEUKERING and JIM BRADLEY, Colorado Bird Observatory, 13401 Piccadilly Road, Brighton, Colorado 80601

Phillips (1977) described the avifauna of the Chihuahuan Desert region as ranking among the least known bird communities of North America. In the intervening nineteen years, little has happened to alter that assessment. In January and February 1996, the Colorado Bird Observatory studied the winter distribution and habitat associations of prairie-breeding birds in the northern Central Mexican Plateau (defined as that area bounded by the international border to the north, the Sierra Madre Occidental to the west, the Sierra Madre Oriental to the east, and the Transvolcanic Belt to the south; hereafter Central Mexican Plateau). We surveyed a variety of grassland types and made ancillary observations of birds in other habitats. Observations reported here were made while traveling between study sites and at daily campsites, all within 10 km of major state and federal highways between Janos, Chihuahua, and Durango, Durango. We noted records of interest for eleven species, mostly of individuals outside the winter ranges as mapped by Howell and Webb (1995).

Our observations were primarily at the following sites:

El Palmito, a small town at the western terminus of Mexico Route 30 on the east side of Lázaro Cardenas Reservoir in north-central Durango. The site is at approximately 25° 34′ N, 104° 56′ W, 10 km northeast of El Palmito, and 1.5 km south of Mexico Route 30 on the road to Los Zarqueños.

La Concepción, a small town in central Chihuahua off Mexico Route 45, about 20 road km south of Palomas and about 60 km SSW of Chihuahua City at 28° 10′ N, 106° 13′ W. The site is along the Río Santa Isabel just east of town.

Ricardo Flores Magón, an ejido (collective farm) on Chihuahua Route 10, halfway between Chihuahua Route 23 and Mexico Route 45 in central Chihuahua, at 29° 57′ N, 106° 58′ W.

Río Nazas, a large river flowing through north-central Durango. The site is the Mexico Route 45 crossing about 170 km north of Durango City at 25° 18′ N, 104° 38′ W.

Villa de Nieves, a small town along Mexico Route 45 in extreme north-central Durango about 20 road km south of the Chihuahua border at 26° 25′ N, 105° 26′ W.

Golden-fronted Woodpecker (*Melanerpes aurifrons*). We found this species in most locations having suitable habitat. The northernmost individual found was a male in riparian habitat near La Concepción on 26 January. We found Golden-fronted Woodpeckers at four other locations, all in Durango, with a maximum of five (three males and two females) at the Río Nazas on 29 January. All birds seen well appeared to be of the nominate race, which is the expected one as it is the form in the United States and in northeastern Mexico. It is distinguished by a nearly all-black tail, wide barring on the back, and, in males, the crown patch is separated from the nape patch (connected in the Pacific slope *polygrammus*).

No species of "*Centurus*" woodpecker is mapped by Howell and Webb (1995) as occurring in the hearts of either Chihuahua or Durango; the western range limit for Golden-fronted Woodpeckers is drawn as roughly paralleling the eastern borders of the two states, whereas, the eastern edge of the range of the similar Gila Woodpecker (*M. uropygialis*) is drawn as roughly paralleling the western edge of the two states. These records of such an obvious species reflect on how little is known about the Central Mexican Plateau avifauna and how little ornithological investigation has been conducted there.

Dusky Flycatcher (*Empidonax oberholseri*). We found two individuals in riparian habitat along the Río Nazas on 29 January. The birds were separated from Hammond's Flycatcher by their long bills, long tails, and short primary extensions. Also, one of them was heard to give a soft "wit" call a few times; the call of Hammond's is a sharper "peek." This site appears to lie at the edge of the winter range mapped for this species by Howell and Webb (1995).

Cassin's Kingbird (*Tyrannus vociferans*). We found this species in numerous locations in Durango in late January. The northernmost location was Villa de Nieves on 28 January, about 260 km north of the winter range limit depicted by Howell and Webb (1995), who mapped it as wintering in Durango only in the extreme west and south. Phillips (1994) seemed to suggest that this species winters on the Central Mexican Plateau, *contra* Howell and Webb (1995), but his statement is somewhat ambiguous: "It does winter in northern Mexico (American Ornithologists' Union 1983), but east of the Pacific slope and north of the highlands of southern Nuevo León (A. M. Sada pers. comm.) it is then hardly more regular than in Texas, where the various winter reports are generally considered dubious."

Tree Swallow (*Tachycineta bicolor*). Bradley saw one flying at Ricardo Flores Magón on 25 January. This site is more than 300 km NNW of the northern limit of the winter range in Chihuahua mapped by Howell and Webb (1995). Phillips (1991) stated that "wintering in N Chihuahua (Oberholser) is dubious."

Northern Rough-winged Swallow (*Stelgidopteryx serripennis*). We found this species numerous (>20 individuals) along the Río Nazas on 29 January and one or two at two other locations farther south in Durango on subsequent days. Howell and Webb (1995) depicted this species as wintering in extreme western Durango and not at all on the Central Mexican Plateau. Phillips (1991) reported some birds "returning N by mid- or late January," so there is some question as to the migratory status of the individuals we saw.

Cave Swallow (*Hirundo fulva*). We saw two Cave Swallows among the Northern Rough-winged Swallows at the Río Nazas on 29 January. The Río Nazas site is within the range of permanent residency depicted by Howell and Webb (1995); however, until recently, little was known of the whereabouts of this species during the nonbreeding season. The few data available suggested that some or most individuals migrated out of Mexico for the winter and/or that wintering in numbers on the Central Mexican Plateau is recent (Howell and Webb 1995, Peterson and Chalif 1973). This has changed with the report by Komar (1997) of in excess of 10,000 Cave Swallows wintering in El Salvador.

Another problem posed is determining the wintering status of individuals seen after December. Phillips (1991) stated that the species may return to Texas as early as 6 February. This suggests that individuals in Durango in late January could be on migration (as in the Northern Rough-winged Swallow). However, Leukering (pers. obs.) has seen the species over the Rio Grande at Bentsen–Rio Grande Valley State Park, Texas, in early January.

European Starling (*Sturnus vulgaris*). Leukering saw two flying over Janos, Chihuahua, on 24 January. Howell and Webb (1995) depicted this species as occuring in Mexico only in the northwestern corner of the country. Janos is on the southern edge of this species' range in Mexico.

Gray Vireo (*Vireo vicinior*). While casually birding around our campsite near El Palmito, Durango, on the morning of 30 January, L. Dombroski found, and the whole field crew observed, a single Gray Vireo foraging in desert scrub. The bird was gray above and whitish below, with a decided resemblance to a gnatcatcher (*Polioptila*) in both plumage and habits. Its bill was typical of *Vireo*, being deep and hooked, despite the bird's small size, not thin, long, and pointed as a gnatcatcher's. Its eye ring was less pronounced than that on a Plumbeous Solitary Vireo (*V. solitarius plumbeus*), and its actions were more energetic than those of a Solitary Vireo, though not as frenetic as

those of a gnatcatcher. The outer webs of the outer rectrices were contrastingly pale (another gnatcatcherlike feature); however, the bird's tail was not as long, relatively, as in a Blue-gray Gnatcatcher (*P. caerulea*). Dombroski heard it twice give the short, harsh rattle call described by Bates (1992). The vireo foraged from near the ground to near the tops of various shrubs ranging to 3.5 m. Dominant plant species of the habitat were Desert Hackberry (*Celtis pallida*) and Ocotillo (*Fouquieria splendens*) with numerous other shrub and ground-cover species present.

This record is apparently the second for this species in Durango; the first was of an individual collected at Inde on 13 August 1898 (Fry *et al.* 1996; this record not depicted by Howell and Webb 1995), now in the Smithsonian. Even though Phillips (1991) described the specimen as "hopelessly worn," he suggested that it represented an undescribed subspecies. The most interesting aspect of this record is that Inde is less than 35 km northwest of the El Palmito site. Except for a very few reports [Barlow and Wauer 1971 (Big Bend National Park), Fry et al. 1996 (San Luis Potosí), and, possibly, Howell and Webb 1995 (Coahuila)], the species is not known to winter outside of Baja California, Sonora, and extreme southern Arizona, though these suggest that this species may be distributed more widely across northern Mexico during the nonbreeding season than is currently recognized.

Wilson's Warbler (*Wilsonia pusilla*). We found a male in riparian vegetation at the Río Nazas site on 29 January, at least 200 km north of the mapped winter range in extreme western and southern Durango (Howell and Webb 1995). B. Howe and D. Hawksworth reported to us a male Wilson's Warbler on 12 January along the Río Casas Grandes, just west of the city of Nuevo Casas Grandes in northern Chihuahua. This site is only 120 km south-southeast of the southeastern corner of the bootheel of New Mexico.

Blue Grosbeak (*Guiraca caerulea*). On 28 January, we found two, one adult male and one brown-plumaged bird, just south of the town of Guadalupe Aguilera, Durango. This site is at least 200 km north or 150 km east of the winter range mapped by Howell and Webb (1995) in extreme western Durango.

Clay-colored Sparrow (*Spizella pallida*). We found this species fairly common at many localities from La Concepción south. The La Concepción site had a large flock of *Spizella* (>75 individuals) on 27 January, with Brewer's and Clay-colored sparrows in a ratio of about 2 or 3:1. This site is 75 km north of this species' winter range as mapped by Howell and Webb (1995).

Baird's Sparrow (*Ammodramus bairdii*). We recorded a total of 53 Baird's Sparrows on 18 of 99 study plots, as well as more than 25 individuals in an extensive grassy pasture at Ricardo Flores Magón, Chihuahua. Generally, areas with denser, taller grass and patches of bare ground contained Baird's Sparrows. We found the species in most patches of suitable habitat from Janos, Chihuahua, in the north, to just north of Durango in the south. Baird's Sparrows occurred with Grasshopper Sparrows (*A. savannarum*) in many places, and the Ricardo Flores Magón site held about equal numbers of the two species.

Concerted efforts to study the avifauna of the Central Mexican Plateau will continue to provide much new information. We were able, with little effort, to record eight species at least 75 km outside of their mapped ranges, with most records of "extralimital" individuals being at least twice that distance from their known ranges. Moreover, many of our records appear to represent resident or regular wintering populations, rather than vagrants or odd individuals.

We thank the members of Colorado Bird Observatory for their support in our research and conservation endeavors, and for providing some of this project's funding. We also thank Howard Ness of the U.S. National Park Service (Mexico Affairs Office) for additional funding. Thanks also go to Carol Beidleman, Cory Counard, Beth Dillon, Louie Dombroski, Joe Kaplan, and Mary Teesdale for volunteering their time and expertise in the field. We also appreciate logistical advice

offered by Bill Howe and Cynthia Melcher and assistance with translation by Carol Beidleman and Beth Dillon. Thanks to Chuck Aid, Mike Carter, Scott Gillihan, Bill Howe, and A. Townsend Peterson for reviewing previous drafts of the manuscript and providing insightful comments thereon.

We truly appreciate, and were constantly amazed by, the unfettered use of private (grazing and agricultural) lands for surveys and/or camping offered us by Mexican landowners, relative to that in the U.S. Their lively conversation and friendly support of our project were eye-openers for every member of our project team. We would particularly like to single out Jorge Chávez-Vega of Ricardo Flores Magón in this respect; his land held the best grassland habitat we saw and the huge flock of *Ammodramus* mentioned above.

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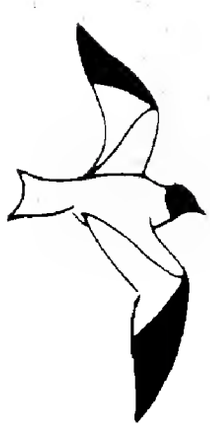

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Cover photo by © Charles T. Collins of California State University, Long Beach, California: Mitred Parakeets *(Aratinga mitrata)*, Long Beach, California, February, 1994.

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WESTERN BIRDS

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POPULATION STATUS AND DISTRIBUTION OF NATURALIZED PARROTS IN SOUTHERN CALIFORNIA

KIMBALL L. GARRETT, Section of Vertebrates, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, California 90007

Data on the identity, population sizes, trends, geographical distributions, and ecological requirements of naturalized populations of non-native, non-game bird species in western North America are limited (see reviews by Hardy 1973, Johnston and Garrett 1994). At the same time, concerns about the actual and potential impacts of such populations on native biota and natural ecosystems are of increasing interest to ecologists (Temple 1992). The resulting "information gap" is perhaps nowhere as evident as with the populations of parrots in southern California. Flocks of parrots of several species are widespread in urban and suburban regions of southern California yet have remained virtually unstudied, with the few published crude population estimates (Hardy 1973, Froke 1981) now being sorely out of date. Even the species identity of parrots currently inhabiting southern California was largely uncommented upon until the brief review by Johnston and Garrett (1994). To date, no parrot species has been accepted for the California state bird list (California Bird Records Committee 1996), reflecting both the absence of good population data and a lack of agreement on what constitutes a naturalized or "established" population. Following Holmes and Stroud (1995), I use the term "naturalized" when referring to established, non-native parrots in southern California, avoiding the commonly misused term "feral," which implies former domestication.

In this era of increasing human modification of the ecological landscape, biologists can no longer reasonably exclude non-native taxa in the quest for basic descriptive data. Parrots are not adequately monitored by standard North American surveys; few Breeding Bird Survey routes (Droege 1990) are located in urban regions, and naturalized species are only erratically reported on Christmas Bird Counts. The distinction between native ("indigenous") and non-native ("exotic") bird species is undeniably of paramount importance in the study of historical avian biogeography and evolutionary

biology, but such distinctions are increasingly blurred in human-manipulated landscapes.

The history of free-flying Psittacidae in southern California is sketchy, with much information on early establishment being anecdotal and unpublished. Early reports (including Hardy 1964 and 1973, Fisk and Crabtree 1974, and numerous unpublished or newspaper accounts summarized by Froke 1981) led to preliminary analyses (Dana et al. 1973, Shelgren et al. 1975) of parrots as potential agricultural pests in California. The legal and illegal importation of hundreds of thousands of parrots into the United States for the pet trade (Banks 1976, Froke 1981, Traffic 1987; Table 2) accelerated during the late 1960s and early 1970s, setting the stage for a vastly more diverse and abundant parrot fauna in California during and after the 1980s. The mechanisms of intentional and unintentional release of parrots into the wild in urban southern California are probably diverse and complex; some releases—e.g., from aviaries, pet stores, or smugglers' holdings—have been told and retold to the point of qualifying as entrenched "urban mythology!" This paper summarizes our current knowledge of the naturalized parrot fauna in the region in an era following this import "boom."

METHODS

From 1994 through June 1997 I solicited sightings of parrots from the greater Los Angeles region (Ventura, Los Angeles and Orange counties, inland to western San Bernardino and Riverside counties) through Audubon chapter newsletters, avicultural clubs, and various public media. I also distributed basic field-identification information through Audubon newsletters (Garrett 1995) and presentations. Target species were identified from existing literature and included additional species for which I or others had made multiple sightings during casual field work prior to 1994. Sightings of all free-flying parrots were requested, however, whether or not they were on the "target" list. I requested the following information: identity of the parrot(s) if known (with supporting documentation, especially if the identification was uncertain), exact location, date and time, and parrot behavior (flying, roosting, feeding, etc., with details).

I field-checked numerous sites, especially where parrots concentrated at roosting or regular foraging areas. Methods for estimating population sizes of parrots in the wild have been described and critically compared by Casagrande and Beissinger (1997); because my primary goal was to establish only the identity, distribution, and approximate sizes of the parrot populations of the region, and because contributing observers were generally untrained, I did not employ standardized census methods.

Field-identification problems have long plagued attempts to gather population data on non-native bird species in North America. Standard field guides treat most of southern California's free-flying parrot species inadequately, if at all. For example, the National Geographic Society field guide (Scott 1987) treats seven non-native parrot species, only four of which are relevant to southern California. Peterson (1990) briefly treats six exotic psittacids, five of which have populations in California (his reasons for attributing the Orange-fronted Parakeet, *Aratinga canicularia*, to southern

California are unclear; it was not recorded during the present study). Robbins et al. (1983) treat twelve parrot species, five of which occur as naturalized populations in California. All of these guides, however, mention a taxon within the Canary-winged Parakeet (*Brotogeris versicolurus*) superspecies that is marginal in California but fail to address the more relevant taxon *B.* [*v.*] *chiriri*, now generally afforded full species status (American Ornithologists' Union 1997). Farrand (1983) treats only the Budgerigar (*Melopsittacus undulatus*) (with no established populations in California) and "Canary-winged Parakeet" (with a photograph of the "correct" form *chiriri* but a text account of *versicolurus*). Griggs (1997) covers four relevant taxa but, again, the "wrong" [= *versicolurus*] Canary-winged Parakeet. Finally, the photographic guide by Stokes and Stokes (1996) does not mention any parrot species. Thus only five of the ten or so naturalized parrot taxa in southern California are treated at all in North American field guides. The fact that our psittacids are derived from the avifaunas of Mexico, South America, and the Indian subcontinent ensures that no other single regional guide covers our entire species pool. The major monographic works on the Psittacidae (e.g. Forshaw 1989) contain much information on systematics and natural history but are not oriented to field identification. During the course of this project I prepared an informal guide to the field identification of those parrot species believed to be naturalized in California (Garrett 1995); excellent general information on the identification of Neotropical parrots is given by Whitney (1996).

In addition to identification problems, there exists a confounding variety of avicultural names for the parrot taxa noted in this survey. Throughout, I use those names adopted by the American Ornithologists' Union (1983, 1997) or extend the nomenclatural policies of that list to extralimital species; for example, I call all *Aratinga* (and closely related *Nandayus*) "parakeets" rather than "conures" and all *Amazona* "parrots" rather than "amazons."

For population estimates and analysis I divided the greater Los Angeles region into several subregions (Figure 1) as follows: North Coast communities (Malibu to Pacific Palisades and Brentwood); South Coast communities (Manhattan Beach south to Redondo Beach, the Palos Verdes Peninsula, and Long Beach); Los Angeles Basin (including the coast from Santa Monica to Westchester); San Fernando Valley (including Simi Valley, Ventura Co.); San Gabriel Valley (including Pasadena, San Marino, South Pasadena, and Highland Park; east to Glendora); and urban Orange County. I arrived at population estimates by summing high counts of what were presumed to be discrete flocks within each subregion; I assumed that there was no overlap of individuals between subregions. Our knowledge of the daily and seasonal movements and home ranges of parrots in the region is fragmentary and, therefore, population estimates are crude but likely to be conservative.

RESULTS

Some 1550 parrot sightings (not all independent) were reported to me between January 1994 and June 1997; these, supplemented with my own field observations, involved at least 33 species of parrots. These fit neatly into two groups: (a) 23 species observed only sporadically, with reports

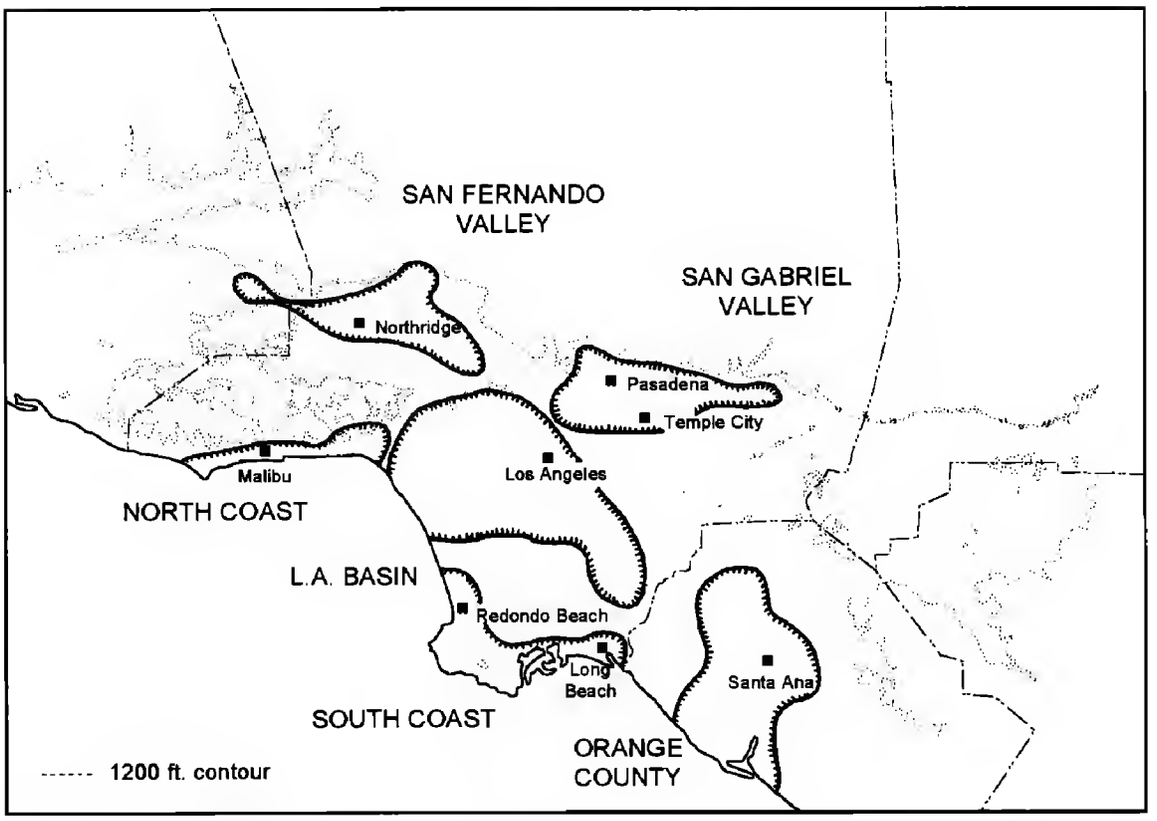

Figure 1. Areas of parrot concentrations in the greater Los Angeles area, showing regions used in Table 1.

rarely involving more than a single individual, and (b) ten "established" species observed frequently, and usually in pairs, small groups or large flocks. Although proof that some of the species in the latter group are maintaining or increasing populations through reproduction in the wild is lacking or equivocal, I treat them all in the discussions below because their numbers appear to be significant (>50 individuals in all but two cases). Reports from urbanized western San Bernardino and Riverside counties were too few to draw conclusions about parrots' status there, so that area is not treated in the main discussion below.

Casually reported, non-established species (group "a" above) were *Agapornis personata* (Masked Lovebird), *A. roseicollis* (Peach-faced Lovebird), *Amazona amazonica* (Orange-winged Parrot), *A. aestiva* (Blue-fronted Parrot), *A. albifrons* (White-fronted Parrot), *A. autumnalis* (Red-lored Parrot), *A. pretrei* (Red-spectacled Parrot), *Ara araruana* (Blue-and-yellow Macaw), *A. chloroptera* (Red-and-green Macaw), *A. macao* (Scarlet Macaw), *A. militaris* (Military Macaw), *Brotogeris pyrrhopterus* (Gray-cheeked Parakeet), *Cacatua galerita* (Sulphur-crested Cockatoo), *Cyanoliseus patagonicus* (Burrowing Parrot), *Eos bornea* (Red Lory), *Melopsittacus undulatus* (Budgerigar), *Myiopsitta monachus* (Monk Parakeet), *Nymphicus hollandicus* (Cockatiel), *Platycercus elegans* (Crimson Rosella), *P. eximius* (Eastern Rosella), *Poicephalus crassus* (Niam-niam Parrot), *Psittacula alexandri* (Red-breasted [Moustached] Parakeet), and *Psittacus erithacus* (Gray Parrot). Two species in this group (Red-lored and Blue-fronted parrots) were often observed in pairs and are known to have bred at

least once in the wild (Mabb 1997; pers. obs.). Some others (especially the Budgerigar and Cockatiel) were reported frequently, but individuals of these species, which are easily and abundantly bred in captivity, do not appear to survive long, and there is no indication of their breeding in the wild in southern California.

The more established species (group "b") are discussed individually in the accounts below.

SPECIES ACCOUNTS

The accounts below provide historical information and data gathered during this study on geographical distribution, habitat associations, population sizes (summarized in Table 1), and trends in the Greater Los Angeles region (including Orange County). All localities are within Los Angeles County unless otherwise indicated.

Rose-ringed Parakeet *Psittacula krameri*

This species is native to the Indian subcontinent and the Sudan belt of Africa; it is the only parrot established in southern California that does not originate from the Neotropics. Naturalized populations in Britain are thought to be of Indian/Asian origin (Morgan 1993); at least some Florida populations are referable to the Indian subspecies *manillensis*. The subspecific identity of southern California birds is uncertain, although bill coloration (and avicultural trends) suggest they too are of the Asian/Indian subspecies *manillensis* or *borealis*. Hardy (1964) documented nesting in a small population in Highland Park, 5 km northeast of downtown Los Angeles, but felt that this population had largely vanished by the early 1970s (Hardy 1973).

Populations of this species exist in coastal Los Angeles County, mainly in Malibu (especially lower Zuma Canyon), Playa del Rey, and Westchester. There is a small population in the San Gabriel Valley (Temple City) and scattered reports from other areas. Rose-ringed Parakeets appear to favor areas with numerous tall sycamores, either natural sycamore woodlands in canyon residential areas (e.g., lower Zuma Canyon) or sycamores planted as urban shade trees (Temple City, Westchester). The population in lower Zuma Canyon has diminished from thirty or more individuals to eleven or fewer since the mid-1980s, perhaps as a result of the establishment of the larger Mitred and Black-hooded parakeets in the area. The overall population in the greater Los Angeles area is estimated at ≥60 individuals.

Blue-crowned Parakeet *Aratinga acuticaudata*

The extensive blue coloration on the heads of free-flying individuals of this species observed in southern California suggests that the nominate subspecies, native to dry woodlands from central Brazil to northern Argentina, is the one occurring in the region. The occurrence of this species in California was not mentioned by Hardy (1973); it was considered "sporadically" reported in southern California by Johnston and Garrett (1994).

During this study flocks of up to 13 individuals were reported regularly from the west-central San Fernando Valley, especially in Northridge. Elsewhere, one small flock was in the Simi Valley, Ventura Co., a flock of up to 15 was in Redondo Beach, and a flock of up to eight was in Monrovia in the San Gabriel Valley. The overall population in the greater Los Angeles area probably does not exceed 50 individuals.

Table 1 Population Estimates for Southern California Parrots by Region[a]

Species	Region[b]						Total
	SF	SG	NC	LA	SC	OR	
Rose-ringed Parakeet	2 [1]	11 [11]	11 [11]	38 [35]	2 [1]	0	64
Blue-crowned Parakeet	23 [13]	8 [8]	0	2 [1]	16 [15]	0	49
Mitred Parakeet	24 [14]	230 [100]	55 [55]	169 [48]	168 [60]	57 [25]	683
Red-masked Parakeet	0	40 [40]	1 [1]	0	30 [30]	0	71
Black-hooded Parakeet	0	24 [24]	87 [40]	50 [50]	0	20 [12]	181
Canary-winged Parakeet	0	0	1 [1]	2 [1]	18 [10]	0	20
Yellow-chevroned Parakeet	1 [1]	27 [25]	0	295 [106]	60 [30]	0	383
Lilac-crowned Parrot	14 [10]	68 [36]	10 [10]	3 [3]	1 [1]	1 [1]	97
Red-crowned Parrot	70 [50]	890 [750]	20 [20]	3 [2]	2 [2]	95 [70]	1080
Yellow-headed Parrot	4 [3]	11 [6]	1 [1]	23 [12]	1 [1]	19 [9]	59

[a]The first number given is the estimated population for the region; it is followed [in brackets] by the largest flock reported within the region.

[b]SF, San Fernando Valley, Los Angeles Co. (including Simi Valley, Ventura Co.); SG, San Gabriel Valley, Los Angeles Co.; NC, north coast, from Malibu to Pacific Palisades, Los Angeles Co.; LA, Los Angeles Basin; SC, south coast, from Manhattan Beach to Palos Verdes Peninsula and Long Beach, Los Angeles Co.; OR, Orange Co. For delineation of these regions, see Figure 1.

Mitred Parakeet *Aratinga mitrata*

This large conure is native from east-central Peru to eastern Bolivia and northwestern Argentina. It belongs to a complex of primarily green species with red markings on the head, none of which is treated in any North American field guide, confounding our understanding of their local status. Its occurrence in California was not published upon until Garrett (1989) and Johnston and Garrett (1994; note corrected population estimate of "hundreds," not "hundreds of thousands"), although C. T. Collins (pers. comm.) reports that this species was present in Long Beach, Los Angeles County, by 1980. The extensive red markings on the heads of most individuals in the region suggest that the nominate subspecies is involved.

During this study flocks of Mitred Parakeets were found in Malibu (especially Zuma Canyon and Pt. Dume), West Los Angeles, Culver City, Venice, central Los Angeles, Manhattan Beach, Redondo Beach, San Pedro, Long Beach, Huntington Beach, Highland Park, Temple City, Arcadia, and El Monte. Maximum flock sizes were 100 in the San Gabriel Valley (Temple City and South San Gabriel), 60 in Palos Verdes Estates, 55 in Malibu (lower Zuma Canyon), 48 in Lakewood, and 47 in Exposition Park south of downtown Los Angeles. Seasonal status and foraging behavior in the Long Beach area are discussed by Collins and Kares (1997). The total population in the greater Los Angeles region was estimated at 680.

Red-masked Parakeet *Aratinga erythrogenys*

Closely related to the Mitred Parakeet, this species is endemic to the arid Tumbesian zone of southwestern Ecuador and northwestern Peru. Adults are best distinguished from *mitrata* by the more solid and extensive red on the head, more extensive red in the underwing coverts, and smaller overall size. This species is considered near-threatened within its native range (Collar 1996). It was not mentioned by Hardy (1973) and was mentioned as "sporadically seen" in southern California by Johnston and Garrett (1994).

The status of this species in southern California is obscured by its similarity to *A. mitrata*; although the two species are readily distinguished given reasonable views, southern California observers are understandably poorly aware of identification criteria. Single birds (at least one bearing a leg ring) were seen with Mitred Parakeet flocks in lower Zuma Canyon (Malibu), at Pt. Fermin (San Pedro), and at Rancho Los Alamitos (Long Beach). Subsequently, small flocks were found in Temple City and adjacent Monrovia, and in Redondo Beach. The greater Los Angeles population estimate of about 70 is tentative pending further field work by observers familiar with *Aratinga* identification.

Black-hooded Parakeet *Nandayus nenday*

Popularly known as the "Nanday Conure," this species occurs naturally in pantanal, savannas and settled areas from southwestern Brazil to northern Argentina. Hardy (1973) mentioned only a small population in Loma Linda, western San Bernardino Co. that became established in the late 1960s; nesting there was suspected by Fisk and Crabtree (1974).

A population of Black-hooded Parakeets has been observed in residential areas and adjacent sycamore-dominated canyon bottoms from the Brentwood district of western Los Angeles to Pacific Palisades, with additional populations farther up the coast from central Malibu to lower Zuma Canyon. Several active nests, usually in sycamores (*Platanus racemosa*), have been documented in the canyons of Brentwood (M. Marin A. pers. comm.; pers. obs.). Elsewhere, small numbers occur in Culver City and the Rancho Park district of West Los Angeles, in the San Gabriel Valley, and in Huntington Beach, Orange Co. An overall population estimate for the region is ≥180 birds.

Canary-winged (White-winged) Parakeet *Brotogeris versicolurus*
Yellow-chevroned Parakeet *Brotogeris chiriri*

Considered conspecific by many authorities (e.g., Forshaw 1989), these taxa occur naturally in northern Amazonia (*versicolurus*) and from southern Amazonia to northern Argentina (*chiriri*). Plumage differences between the two forms are striking, and their status as full species has been argued by Pinto and Camargo (1957) and adopted by the American Ornithologists' Union (1997). "Canary-winged" Parakeets (subspecies not noted) had established populations in San Pedro and the adjacent Palos Verdes Peninsula, Los Angeles Co., and in western Riverside Co. by the early 1970s (Hardy 1973). Nesting of *B. versicolurus* was documented at Pt. Fermin, San Pedro, Los Angeles Co., in June 1973 (one of four nestlings preserved as a study skin; UCLA 37822); additional specimens (e.g. LACM 85923, 28 November 1972, Pt. Fermin) are also of *B. versicolurus*. Since the early 1980s flocks of "Canary-winged" Parakeets in the Los Angeles Basin have consisted mostly or exclusively of *B. chiriri*, the Yellow-chevroned Parakeet (Garrett 1993); United States importations of "Canary-winged Parakeets" shifted from *versicolurus* to *chiriri* during the 1970s (Arrowood 1981). The only specimen of *chiriri* from naturalized southern California populations was taken in Eagle Rock, 10 km north of the Los Angeles Civic Center, on 22 June 1997 (California State University Northridge Vertebrate Collections 1400).

Currently Yellow-chevroned Parakeets are widespread within the Los Angeles Basin, from downtown and south-central Los Angeles west to West Hollywood and Beverly Hills and north to Highland Park, Eagle Rock, South Pasadena, and San Marino. Although Yellow-chevroned Parakeets are frequently associated with fruiting Silk-floss Trees (*Chorisia speciosa*) in the region (Garrett et al. 1997), the distributions of the bird and the tree are currently not congruent (e.g., *Chorisia* is commonly planted in the San Gabriel Valley where the parakeet is largely absent). Flocks also occur from San Pedro and the Palos Verdes Peninsula north to Redondo Beach and Torrance. Curiously, this species is essentially absent from several areas of high parrot abundance such as the Temple City/Arcadia area of the San Gabriel Valley, the northern San Fernando Valley, the Malibu coast, and urban Orange County, perhaps reflecting a set of ecological requirements or physiological tolerances that differ greatly from those of larger psittacids.

Canary-winged Parakeets (*B. versicolurus*) are now scarce in the region. A flock of eight was found near Lunada Bay on the Palos Verdes Peninsula in December 1996, and up to one-fourth of a flock of 40+ *Brotogeris* in Redondo Beach was estimated to be of this "white-winged" form in winter 1996–97. Single Canary-wingeds have been noted with large flocks of Yellow-chevroned Parakeets in Exposition Park, 5 km southwest of downtown Los Angeles, on several occasions, and one was observed near (but not with) a small group of Yellow-chevroned Parakeets in Huntington Park in spring 1997.

The total population of Yellow-chevroned Parakeets in the region is at least 380; numbers of the Canary-winged currently may not exceed 20 individuals.

Red-crowned Parrot *Amazona viridigenalis*

This species is endemic to (and declining in) northeastern Mexico (Enkerlin-Hoeflich and Hogan 1997). This and the following species represent allospecies (Sibley and Monroe 1990), and difficulty in field identification (see below), especially in low light when parrots gather at roost sites, has hampered the determination of their status in southern California. The Red-crowned is now clearly the more abundant of the two. Hardy (1973) considered this species "very rare, and very local" in southern California, citing records back to 1963 but no confirmation of breeding. Froke (1981) recorded 50 *viridigenalis* and documented nesting in the San Gabriel

Valley, Los Angeles Co., from 1973 to 1978, and an unspecified proportion of a flock of 36 *Amazona* parrots in West Los Angeles during that period were of this species. He did not determine the species identity of smaller groups of *Amazona* noted in Pomona (Los Angeles Co.), Orange Co., western San Bernardino Co., and San Diego Co. Red-crowned Parrots have been present and increasing in urban Orange County since the early 1970s (Gallagher 1997). This species is now the most abundant psittacid in the greater Los Angeles region.

The center of abundance of this species is the San Gabriel Valley, from Altadena, Pasadena and Highland Park east to Glendora; up to 750 individuals have been estimated attending pre-roosting aggregations in Temple City (Mabb 1997a; pers. obs.). Substantial populations also occur in the northern San Fernando Valley (Panorama City and Mission Hills west to Northridge and north to Sylmar), and at least 20 birds are found on the Malibu Coast in the vicinity of Pt. Dume and lower Zuma Canyon. In urban Orange County (Santa Ana, Orange, Tustin, Anaheim, and Fullerton), flocks of fifty to seventy were reported in this study and by Gallagher (1997). Confirmation of breeding, usually through sightings of dependent, begging juveniles, has been routine in the San Gabriel Valley (Mabb 1997b) and Orange County (Gallagher 1997), as well as at Pt. Dume, Malibu (this study). A total regional population estimate of 1080 is perhaps conservative.

Lilac-crowned Parrot *Amazona finschi*

This species is resident in western Mexico from southeastern Sonora to southern Oaxaca; criteria for separation in the field from the Red-crowned Parrot are given by Howell and Webb (1995) and Garrett (1995). Briefly, the Lilac-crowned has the red of the head restricted to a band of dull maroon across the forehead and has an extensive wash of lilac through the crown; the Red-crowned shows a bright red forehead and forecrown (extending in males to the center of the crown) and variable blue which is usually restricted to the sides of the crown. The cere of the Lilac-crowned is dusky or dark gray but pinkish-flesh in the Red-crowned. At rest and in flight the Lilac-crowned is noticeably longer-tailed. Finally, although many vocalizations of these two species are similar (and even appropriated from one another?), the distinctive squeaky upslurred whistle of the Lilac-crowned differs from the typical downslurred whistle of the Red-crowned. Hardy (1973) did not mention this species for southern California, but Froke (1981) recorded a minimum of 22 individuals in the San Gabriel Valley from 1976 to 1978, with nesting evidence.

In this study Lilac-crowned Parrots were usually found among larger numbers of Red-crowned Parrots, with the majority in the San Gabriel Valley and smaller populations in the northern San Fernando Valley and the Malibu coast. The population estimate of nearly 100 birds should be refined with more intensive study of *Amazona* flocks.

Yellow-headed Parrot *Amazona oratrix*

The allospecies *A. oratrix, A. auropalliata* (Yellow-naped Parrot), and *A. ochrocephala* (Yellow-crowned Parrot), occurring from eastern and southwestern Mexico south to Amazonian South America, are among the most popular parrots for aviculture. Largely because of the drain of wild populations for the pet bird trade, as well as habitat destruction, northern *oratrix* (native from southwestern and eastern Mexico south to northwestern Honduras) has declined severely within its native range, with the loss of up to 90% of its numbers since the mid-1970s (Collar 1996). Earlier workers in southern California did not distinguish among these taxa but reported "Yellow-headed" (Hardy 1973) and "Yellow-crowned" (Froke 1981) parrots widely in the western San Gabriel Valley, West Los Angeles, and elsewhere; the latter author documented one case of nesting. Flocks of ten to twenty Yellow-headed Parrots were

seen routinely in West Los Angeles in the 1970s (pers. obs.), and this species' presence in urban Orange County dates to at least the early 1970s (Gallagher 1997).

The numbers of Yellow-headed Parrots in the greater Los Angeles region appear to have declined since the 1970s. The largest single flocks reported during this study were of twelve in Mar Vista (West Los Angeles) and nine in Costa Mesa; recent nestings have been documented in Garden Grove, Orange County (Gallagher 1997). The overall regional population is probably less than 60 birds.

DISCUSSION

Areas of parrot concentrations are evident in the San Gabriel Valley, the coastal regions from Malibu to Orange County, the northern and central San Fernando Valley, and urban Orange County. The larger parrots of the genus *Amazona* are most numerous in the San Gabriel Valley and, secondarily, in the San Fernando Valley and urban Orange County; however, they are scarce within the Los Angeles basin proper and in the coastal communities of Los Angeles County (except for small flocks in lower Zuma Canyon/Pt. Dume). Small *Brotogeris* are essentially limited to the Los Angeles basin, the South Coast communities (from San Pedro and Palos Verdes Peninsula north to Redondo Beach), and the southwestern San Gabriel Valley (San Marino). Intermediate-sized *Aratinga*, *Nandayus,* and *Psittacula* are primarily coastal, although significant flocks of *Aratinga mitrata* and smaller numbers of the other species occur in inland parts of the Los Angeles basin and the San Gabriel Valley.

The data presented here show important changes from the southern California situation in the 1960s and early 1970s as described by Hardy (1973); some of these changes are undoubtedly due to the more intensive effort of the present survey, but there can be little doubt that populations of many species have increased greatly in the past 25 years. These increases are probably explained by a combination of the following factors: (1) the massive importation of parrots, particularly from the Neotropics, into the United States from the late 1960s through mid-1980s, (2) the increasing human population in southern California, with its associated conversion of natural and agricultural landscapes to urban and suburban landscapes with a diverse exotic flora, and (3) continuing "urban succession," reflecting the maturation of exotic plantings to more complexly layered "woodlands." Hall (1988) found a mean canopy height of 24 m and canopy coverage of 30% at 15 sites occupied by *Amazona* parrots in southern California, and such exotic "woodlands" are undoubtedly increasing.

Currently, the use of natural habitats by parrots in the region is minor, and such habitats are exploited primarily for nest sites. Black-hooded Parakeets, in particular, nest in natural sycamore-dominated canyons in the West Los Angeles and Pacific Palisades areas, but their foraging is largely confined to exotic plantings in surrounding neighborhoods. A pair of Lilac-crowned Parrots occupied a probable nest cavity in a Big-cone Douglas-fir (*Pseudotsuga macrocarpa*) within native coniferous forest at about 1600 m elevation southeast of Mt. Wilson, San Gabriel Mountains, in the spring of 1995 (Los Angeles County Breeding Bird Atlas data), but parrot presence is still quite marginal in these native montane forests. Nesting sites documented by

Mabb (1997b) were in planted shade trees in suburban residential areas; the use of various non-native palm species as nest sites was widely, though anecdotally, reported during the present study.

Foraging habits of naturalized parrots in the region have not received intensive study. Nearly all of the food items summarized by Garrett et al. (1997) represent non-native plant taxa, and essentially no foraging within natural woodland or scrub habitats has been reported. Roosting sites (Mabb 1997a) were in planted trees in residential areas; most identified roost trees were non-native, although native live oaks (*Quercus agrifolia*) and sycamores may be used.

Of potential interest to systematists is the artificial sympatry in southern California of naturalized populations of normally allopatric congeners, most notably the Yellow-chevroned and Canary-winged parakeets, Mitred and Red-masked parakeets, and Red-crowned and Lilac-crowned parrots. Given the difficulties of identifying hybrid offspring of these pairs under field conditions, little if any evidence exists for hybridization or introgression in our region. Mixed Red-crowned × Lilac-crowned parrot pairs have been observed at nest sites in the San Gabriel Valley (Mabb 1997b), with unknown outcome. No mixed pairs or hybrid offspring of the Mitred and Red-masked have been observed, although the two species join together in mixed feeding and pre-roosting flocks in the San Gabriel Valley and Redondo Beach areas. Similarly, no mixed pairs or suspected hybrids between the Yellow-chevroned and Canary-winged parakeets have been reported. The pattern of Yellow-chevroned Parakeet populations essentially replacing those of the Canary-winged, a pattern also noted in southern Florida (Smith and Smith 1993), perhaps solidifies the biological-species status of these forms (whereas large scale assimilation and intergradation might argue otherwise). Possible interbreeding of parrot taxa in the "artificial" southern California species pool bears more thorough investigation.

Although trends of population increase in parrot populations of southern California are overwhelmingly evident, the future of such populations is unclear. The increase in southern California parrot populations in the 1970s and 1980s occurred during a period of large-scale psittacid importation (Table 2). Only continued monitoring will reveal whether recruitment through reproduction will balance the presumed decrease in immigration with cutbacks in legal importations (a confounding factor is the unknown degree of continued illegal importation). The impacts of potentially limiting resources (e.g. nest sites), predation, and exploitation of nestlings for pets will need to be investigated.

Naturalized parrots occur far more widely in California than the greater Los Angeles region. Reporting was insufficient during the present study to arrive at population estimates for other urban regions. At a minimum, parrot populations currently exist in the following areas: urban western San Bernardino and Riverside counties (Red-crowned Parrot, Yellow-headed Parrot; this study); Palm Springs, Riverside Co. (Red-crowned Parrot; this study); San Diego/El Cajon, San Diego Co. (Blue-crowned Parakeet, Mitred Parakeet?, Red-crowned Parrot, Lilac-crowned Parrot; this study, P. Unitt pers. comm.); Borrego Springs, San Diego Co. (Lilac-crowned Parrot; this

Table 2 Importation Data for Selected Parrot Species[a]

Species	1968–1972	1981–1985
Naturalized in southern California		
Rose-ringed Parakeet	8,726	not recorded
Blue-crowned Parakeet	200	54,866
Mitred Parakeet	0	41,549
Red-masked Parakeet	11	26,375
Black-hooded Parakeet	13,625	74,198
Canary-winged Parakeet[b]	262,755	21,184
Lilac-crowned Parrot	29	6,868
Red-crowned Parrot	7,733	1,714
Yellow-headed Parrot[c]	10,968	32,347
Not currently naturalized in southern California		
Orange-fronted Parakeet	75,587	6,059
Gray-cheeked Parakeet	10	50,186
Monk Parakeet	63,910	52,657
Blue-fronted Parrot	8,765	65,116
Orange-winged Parrot	3,586	49,283
Red-lored Parrot	2,022	18,817

[a]Figures for 1968-1972 adapted from Banks (1970), Banks and Clapp (1972), Clapp and Banks (1973a, 1973b), and Clapp (1975); those from 1981-1985 from Traffic (1987). See text for discussion and caveats.

[b]Includes both Canary-winged and Yellow-chevroned parakeets.

[c]Includes Yellow-headed, Yellow-naped, and Yellow-crowned parrots.

study); Monterey Peninsula, Monterey Co. (Black-hooded Parakeet?, Red-crowned Parrot; Roberson and Tenney 1993); the San Francisco Bay area (Blue-crowned Parakeet, Mitred Parakeet, Red-masked Parakeet, Yellow-chevroned Parakeet, Canary-winged Parakeet; Arrowood 1980; S. Rottenborn, M. Bittner, L. Cole, M. Feighner pers. comm.); and Sacramento (Mitred Parakeet, Blue-crowned Parakeet?, Black-hooded Parakeet?; T. Manolis, D. Shaw pers. comm.).

The naturalized parrot populations in southern California should provide numerous opportunities for further investigation. More detailed censuses (see methods described and tested by Casagrande and Beissinger 1997) are appropriate now that the general framework of parrot distribution in southern California has been provided. Increasing observer awareness of identification criteria for similar species of *Aratinga* and *Amazona* should lead to refined population data for several species. The impacts of parrots on resources that sustain native species (e.g., seeds and fruits of native plants, nest cavities, etc.) will increasingly bear investigation. Finally (after Wiley et al.1992), the conservation implications of established California populations of threatened parrot species should be investigated. For example, *Amazona viridigenalis* and *A. oratrix* are considered to be of "high" conservation and research priority by Stotz et al. (1996); southern California populations, if not genetically compromised, might constitute a source for

reintroductions into native habitats, given that the use of captive-bred parrots in reintroduction schemes is fraught with difficulties (Derrickson and Snyder 1992).

SUMMARY

At least ten species of parrots currently appear to be naturalized in the greater Los Angeles region of southern California; population sizes of these species vary from approximately 20 (Canary-winged Parakeet) and 50 (Blue-crowned Parakeet) to over 1000 individuals (Red-crowned Parrot). Most of these species have undergone considerable population growth since the 1960s and early 1970s, although at least two (*Amazona oratrix* and *Brotogeris versicolurus*) appear to have decreased. Further population adjustments seem likely, given the continually changing landscape of urban (and urbanizing) southern California and adjustments to regulations governing importations of parrots from their native ranges. With few exceptions these naturalized parrots are limited to urban and suburban habitats dominated by an exotic flora that provides food sources throughout the year as well as nest sites. Our understanding of ecological interactions of parrots with native bird species is poor; although such interactions appear to be limited at present they should be carefully monitored in the future.

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FOOD ITEMS OF NATURALIZED PARROTS IN SOUTHERN CALIFORNIA

KIMBALL L. GARRETT, Section of Vertebrates, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, California 90007

KAREN T. MABB, CHARLES T. COLLINS, and LISA M. KARES, Department of Biological Sciences, California State University, Long Beach, California 90840

The increasing establishment of parrots in southern California, with populations now exceeding 2500 individuals in the greater Los Angeles area alone (Garrett 1997), suggests that impacts of these non-native species on food resources could become substantial. Although largely confined to highly modified urban and suburban habitats dominated by non-native flora, the several naturalized parrot taxa nevertheless may damage ornamental and commercial fruit trees and possibly compete with native bird species for food. Such concerns have led us to compile data on food use of parrots in the greater Los Angeles region of southern California, data we gathered while conducting research reported by Garrett (1997), Mabb (1997a, b), and Collins and Kares (1997).

Published data on parrot food items in California are few. Froke (1981) compiled food data for three *Amazona* species in the San Gabriel Valley. Particularly important items in his study included fruits, seeds, or flowers of the English Walnut (*Juglans regia*), Sweet Gum (*Liquidambar styraciflua*), Camphor (*Cinnamomum camphora*), Blue Gum (*Eucalyptus globulus*), juniper (*Juniperus* spp.), Western Sycamore (*Platanus racemosa*), and Pecan (*Carya illinoensis*). Arrowood (1981) listed some food items of "Canary-winged Parakeets" (*Brotogeris versicolurus/chiriri*) in southern Los Angeles County and San Francisco. The data we present are the first to include the complete taxonomic range of parrots naturalized in southern California; we provide data for nine species (no recent data were available for the Canary-winged Parakeet, *Brotogeris versicolurus* sensu stricto, which is marginally established in the region).

METHODS

Foraging observations were ours, or reported to Garrett by numerous observers during his general surveys of the status and distribution of parrots in the greater Los Angeles area (Garrett 1997). Foraging observations are skewed toward the most abundant species (e.g., *Amazona viridigenalis*) or those residing in the most intensively studied areas (e.g., the San Gabriel Valley). The data are presented in the form of a matrix of food items and parrot species; because of uneven regional and taxonomic effort, we do not present quantitative data on food use but rather rank the usage of each item in four categories: no use noted, one to four observations, five to ten (or more) observations, and important or regularly used food sources, usually with >10 observations or >25% of all foraging observations of that species.

RESULTS AND DISCUSSION

Table 1 shows the usage of food items for nine established parrot species in the greater Los Angeles region. The number of food items (excluding those at feeders) detected per species (Table 2) varies from three (Yellow-headed Parrot) and six (Red-masked and Blue-crowned parakeets) to 21 (Lilac-crowned Parrot), 24 (Red-crowned Parrot), and 32 (Mitred Parakeet; Figure 1), with a mean of 13.6 items per species. These numbers should not be interpreted as dietary breadths, as they appear to correlate mainly with the frequency with which the species is observed (which, in turn, depends largely on the parrot species' abundance). Dietary overlaps are great, and considerably more study, incorporating seasonal variation, is required to detect the ways in which parrot species might differ in resource utilization. More study is also needed to determine the degree of resource specialization by naturalized parrots in southern California. For example, Yellow-chevroned Parakeets (*Brotogeris chiriri*) predictably exploit the seeds (borne in large

Figure 1. Mitred Parakeet, *Aratinga mitrata*, feeding on fruits of *Myoporum laetum* in lower Zuma Canyon, Malibu, Los Angeles County, 24 September 1994.

Photo by Kimball L. Garrett

Table 1 Parrot Food Items in the Greater Los Angeles Region[a]

Food	PK	NN	AA	AM	AE	BC	AF	AO	AV
Fruits/seeds									
Sycamore/plane tree *Platanus* spp.	**	**		***	*		***		***
Fig *Ficus* spp.				**			***		***
Sweet Gum *Liquidambar styraciflua*		*		*			***		***
Walnut *Juglans regia*	*			*		*	**	*	**
Oak *Quercus* spp.	*	*		*			**		**
Pecan *Carya illinoensis*							***		***
Apricot *Prunus armeniaca*							***		***
Magnolia *Magnolia grandiflora*	*	*		**			*		*
Chinaberry *Melia azedarach*	*						*		**
Catalina Cherry *Prunus ilicifolia* ssp. *lyonii*	*		*	*		*			
Palms Araceae				*		*	*		*
Olive *Olea europaea*				*			*	*	*
Silk-floss Tree *Chorisia speciosa*						***			
Brazilian Pepper *Schinus* spp.			**	*					
Myoporum *Myoporum laetum*				**	*				
Redwood *Sequoia sempervirens*	*					**			
Cotoneaster *Cotoneaster* spp.			*	*	*				
Pine *Pinus* spp.				*			*		*
Sunflower *Helianthus* spp.		*	*	*					
Carob *Ceratonia siliqua*	*						*		*
Orchid tree *Bauhinia spp.*	*						*		*
Hackberry *Celtis* spp.				*	*				
Apple *Malus* spp.				*			*		
Cypress *Cupressus* spp.		*		*					
Camphor tree *Cinnamomum camphora*	*			*					
Carrotwood *Cupaniopsis anacardioides*				*					*
Chinese Elm *Ulmus parviflora*	*					*			
Alder *Alnus* spp.									*
Almond *Prunus amygdalus*									*
Ash *Fraxinus* sp.				*					
Avocado *Persea americana*							*		
Birch *Betula* spp.									*
Black locust *Robinia pseudoacacia*				*					
Bottlebrush *Callistemon* spp.									*

Table 1 (*Continued*)

Food	PK	NN	AA	AM	AE	BC	AF	AO	AV
Coffeeberry									*
Rhamnus spp.									
Golden Arborvitae									*
Thuja spp.									
Juniper *Juniperus* spp.				*					
Kumquat				*					
Fortunella spp.									
Loquat				*					
Eriobothrya japonica									
Mimosa				*					
Albizia julibrissan									
Mulberry *Morus* spp.							*		
Norfolk Island "pine"				*					
Araucaria heterophylla									
Orange *Citrus sinensis*							*		
Peach *Prunus persica*				*					
Persimmon			*						
Diospyros spp.									
Pomegranate						*			
Punica granatum									
Primrose tree				*					
Lagunaria pattersonii									
Silver maple	*								
Acer saccharinum									
Tulip tree								*	
Liriodendron tulipifera									
Flowers/nectar									
Eucalyptus	*	*	*	*	*	*	**		***
Eucalyptus spp.									
Jacaranda						**	**		**
Jacaranda acutifolia									
Red Ironbark				***		***			
Eucalyptus									
Coral tree	*			*		*			
Erythrina spp.									
Lemon-scented Gum				*					*
Eucalyptus citriodora									
Acacia *Acacia* spp.							*		
Cape Honeysuckle					*				
Tecomeria capensis									
Feeders									
Wildbird seed mix	**	*		*	*	**			
Sunflower (feeder)	*	*			*				
Peanuts (feeder)	*	*							
Corn		*							

[a]Within each category food items are listed by decreasing degree of use.

Key to parrot species: PK, *Psittacula krameri* (Rose-ringed Parakeet); AA, *Aratinga acuticaudata* (Blue-crowned Parakeet); AM, *A. mitrata* (Mitred Parakeet); AE, *A. erythrogenys* (Red-masked Parakeet); NN, *Nandayus nenday* (Black-hooded Parakeet); BC, *Brotogeris chiriri* (Yellow-chevroned Parakeet); AF, *Amazona finschi* (Lilac-crowned Parrot); AV, *A. viridigenalis* (Red-crowned Parrot); AO, *A. oratrix* (Yellow-headed Parrot).

Degree of usage: [blank], no usage detected; *, one to four observations; **, five to ten (+) observations; ***, important food item, usually with >10 observations or >25% of all foraging observations for that species.

Table 2 Number of Foods Recorded for Naturaized Parrots in Greater Los Angeles[a]

Parrot	Number of foods
Psittacula krameri[b]	14
Nandayus nenday[b]	7
Aratinga acuticaudata[b]	6
Aratinga mitrata[b]	32
Aratinga erythrogenys[b]	6
Brotogeris chiriri[b]	11
Amazona finschi	21
Amazona viridigenalis	24
Amazona oratrix	3

[a]Not including items at feeders.

[b]Also noted at seed feeders.

pods) of the Silk-floss Tree (*Chorisia speciosa*; Figure 2), but the degree to which their survival in the region depends on this common ornamental tree is unknown.

The mean number of parrot species using a particular food item (excluding seeds at feeders) was 2.2. For this calculation all *Eucalyptus* were treated as one food item, though specialization within that genus likely (e.g., some parrots using the nectar-rich red flowers of *E. ficifolia*, others chewing the unopened flower capsules of *E. globosus* or other species). Especially important food sources for naturalized parrots in southern California identified in this study include *Eucalyptus* spp., walnut (*Juglans regia*), sycamore (*Platanus racemosa*, but probably also exotic plane trees, *Platanus* × *acerifolia*), oak (*Quercus* spp.), Sweet Gum (*Liquidambar styraciflua*), Magnolia (*Magnolia grandiflora*) olive (*Olea europaea*), and various palms (Araceae). Seed provided at feeders is a frequent food item of the small and medium-sized species (*Brotogeris*, most *Aratinga, Nandayus, Psittacula*), but not of *Amazona* parrots.

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Figure 2. Yellow-chevroned Parakeet, *Brotogeris chiriri*, at seed pods of Silk-floss Tree, *Chorisia speciosa*, in Exposition Park, Los Angeles, 6 April 1989.

Photo by Kimball L. Garrett

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ROOSTING BEHAVIOR OF NATURALIZED PARROTS IN THE SAN GABRIEL VALLEY, CALIFORNIA

KAREN T. MABB, Department of Biological Sciences, California State University, Long Beach, California 90840 (current address: 6213 N. Cloverly Ave., Temple City, California 91780)

In recent decades, southern California has seen changes, both increases and decreases, in the population status of many species of birds (Jehl and Johnson 1994). Among the increasing populations are some introduced species, particularly many parrots (Johnston and Garrett 1994). Parrots have been observed in southern California for over thirty years with reports of Red-crowned (= Green-cheeked) Parrots (*Amazona viridigenalis*), Yellow-headed Parrots (*A. oratrix*), Red-lored Parrots (*A. autumnalis*), Black-hooded Parakeets (*Nandayus nenday*), and Rose-ringed Parakeets (*Psittacula krameri*) dating back to the 1960s and 1970s (Fisk and Crabtree 1974, Hardy 1964, 1973). Only one previous study of naturalized parrots in California, in the vicinity of Arcadia (Froke 1981), and a study of parrots in Costa Rica (Chapman et al. 1989) provide information on roosting behavior.

Currently, many species of parrots are found regularly in the Los Angeles area (Garrett 1997), many occurring in large numbers and assembling in large roosting associations. I present here my observations of one such roosting assemblage from 17 May 1995 to 16 August 1997, involving a total of 74 days during this period. My observations emphasized the number and species identity of birds using the roost, roost location, and tree species occupied.

MATERIALS AND METHODS

I made my observations in Temple City and Arcadia, in the San Gabriel Valley of Los Angeles County, California. I noted where parrots roosted and mapped the general roosting area (see Figure 1 in Garrett 1977) as well as more localized clusters on a street map. I used 7 × 35 binoculars, a 22× wide-angle spotting scope, and the unaided eye and ear to determine which species were present.

I initially located parrots by conducting counts on foot, following flying groups of parrots visually, and by listening for their vocalizations. Once I located a roost site, I monitored it until birds no longer roosted there. When parrots change their roost site, they tend to visit the old site to forage before flying to the new site (pers. obs.); thus, I discovered the location of the new site by waiting at, and following birds from, the old site. I conducted observations from late afternoon until sunset. I determined the number of parrots by estimating the number of parrots in each occupied tree, estimating the number of parrots flying into the roost, counting the parrots perched on power lines and utility poles, and subtracting an estimate of parrots flying away from the roost. I did not include parrots circling the roost with the estimate of ones leaving the roost. I noted which species were present, but included Red-crowned and Lilac-crowned parrots as "*Amazona* spp."

because of the difficulty in distinguishing between the two when they perch in shady trees in poor pre-sunset lighting. I noted the tree species used for roosting on each occasion, and seasonal changes in tree type selected. I determined the time of roosting to be the time when the majority of parrots were silent, discounting unsettling by disturbance. Sources of disturbance included humans and American Crows (*Corvus brachyrhynchos*); crows tended to roost after the parrots and occasionally harassed parrots already settled down at roosts.

RESULTS

The roosting flocks consist mainly of Red-crowned and Lilac-crowned (*Amazona finschi*) parrots (Figure 1), which occur in ratios of up to 8 to 1, respectively. I regularly observed Rose-ringed Parakeets in the entire study area and frequently observed Mitred Parakeets (*Aratinga mitrata*) and Red-masked Parakeets (*Aratinga erythrogenys*) in the eastern portion of the study area (Table 1). I also made occasional observations of the following: White-fronted Parrot (*A. albifrons*), Red-lored Parrot (*A. autumnalis*), Blue-fronted Parrot (*A. aestiva*), Yellow-headed Parrot, Blue-crowned Parakeet (*Aratinga acuticaudata*), and Black-hooded Parakeet (Table 1). I observed a Gray Parrot (*Psittacus erithacus*), a Cockatiel (*Nymphicus hollandicus*), and an unidentified parrotlet (*Forpus* sp.) on single occasions (Table 1). The overall monthly average number of parrots was lowest in the spring and early summer; an average of only 40 individuals was present in May 1995,

Figure 1. Pre-roosting aggregation of amazon parrots, mostly *Amazona viridigenalis*, in Temple City, Los Angeles County, November 1996.

Photo by Kimball L. Garrett

Table 1 Abundance and Occurrence of Parrots at Temple City/Arcadia roosts, 1995–1997

Species	Number of individuals seen (range)	Number of times species seen (%)	Number of observation visits to roost[a]
Amazona viridigenalis/finschi	20–750	74 (100%)	74
Amazona autumnalis	0–2	15 (21%)	72
Amazona aestiva	0–2	12 (17%)	70
Amazona albifrons	0–1	2 (6%)	31
Amazona oratrix	0–1	4 (7%)	58
Aratinga mitrata	0–100	15 (21%)	72
Aratinga erythrogenys	0–25	9 (50%)	18
Aratinga spp.	0–1	4 (6%)	72
Aratinga acuticaudata	1	1 (7%)	14
Forpus spp.	1	1 (4%)	23
Nymphicus hollandicus	1	1 (4%)	23
Nandayus nenday	0–3	2 (14%)	14
Psittacula krameri	0–15	56 (76%)	74
Psittacus erithacus	1	1 (7%)	14

[a]Number of observation visits to localized roost areas within the general roost area; not all localized roosts checked in each visit.

52 in July 1995, 50 in April 1997, and 50 in May 1997 (Table 2). There was also a low monthly average number, 75, in December 1995. Parrot populations were highest in the fall and winter, reaching monthly averages of 500 individuals in November 1995 and November 1996, 400 in February 1996, and 542 in January 1997 (Table 2). There was also a high monthly average number, 625, in August 1997.

Roost sites were in suburban neighborhoods, developed in the 1940s. Individual trees used were usually those lining streets with single-family dwellings, with the exception of a period between 17 December 1996 and 21 February 1997 when on seven days up to 750 parrots roosted in fig trees (*Ficus microcarpa*) in a brightly lit parking lot of a busy supermarket. It was not possible to determine an exact time when parrots first entered the roost area, as parrots also forage in and around the trees they roost in until just prior to settling down to roost. On some occasions, they made numerous trips to and from the roost area and foraging sites in groups of two to 20 individuals. On other days, they flew directly into the roost area shortly before sunset in large groups of up to hundreds of individuals. In the summer, parrots tended to frequent the roost area approximately 30–60 minutes before sunset. In the winter, parrots tended to arrive at their roost location only 5–20 minutes before sunset. Even so, there was considerable variability in their arrival time, and I could not discern a set pattern. Parrots entered the roost area sporadically until all had roosted. Many times, small flocks of parrots continued to straggle in after the majority of the roosting assemblage was perched and quiet. Roosting parrots are highly vocal until shortly before total darkness, when they become abruptly silent. Often, approximately five

Table 2 Average Numbers and Roost Trees of Parrots Roosting in Temple City and Arcadia, 1995–1997

	Average number of parrots			
Month	All Psittacidae	Red-crowned and Lilac-crowned Parrots	Tree species[a]	Tree type[b]
May 1995	40	40	Euc/SG	E/D
June	—	—	—	—
July	52	52	Syc/SG	D
August	292	290	Syc/SG	D
September	377	375	SG	D
October	380	375	SG	D
November	501	500	CW	E
December	86	75	CW	E
January 1996	407	343	Euc/LO	E
February	417	400	Euc	E
March	366	350	Euc/Syc	E/D
April	276	272	SG/Syc/LO	D
May	102	100	Syc/SM	D
June	349	347	SG/Syc/LO	D/E
July	—	—	—	—
August	380	325	Syc	D
September	356	350	Syc	D
October	—	—	—	—
November	511	500	Syc	D
December	252	250	LO/Fig	E
January 1997	542	538	Fig/Euc	E
February	296	279	Fig/Euc/Syc	E/D
March	179	175	Syc/SM	D
April	50	50	SM	D
May	50	50	SM	D
June	131	107	Syc/LO	D/E
July	337	330	Syc	D
August	629	625	Syc	D

[a]CW, Carrotwood (*Cupanopsis anacardiodes*); Euc, *Eucalyptus* spp. Fig, fig (*Ficus microcarpa*); LO, live oak hybrid (*Quercus* spp.); SG, Sweet Gum (*Liquidambar styracifolia*); SM, Silver (= Soft) Maple (*Acer saccharinum*); Syc, Western Sycamore (*Platanus racemosa*).

[b]E, evergreen; D, deciduous.

minutes before roosting, there was an increase in activity, with parrots calling, flying between branches or trees, and circling within and around the roost area. In the breeding season, fledglings can be heard begging for food well after all of the other parrots are silent.

From approximately 30 minutes before sunset until the time of roosting parrots engage in various social behaviors on power lines and trees near the roost site. These groups numbered from 20 to 100 or more individuals. They spent most of this time preening and allopreening. They engaged in a variety of displays including hanging upside down, tail-fanning, nape-raising,

wing-spreading, pupil dilation, feigned attacks with bills agape, bill wiping on perches, and head-bowing (Copsey 1995, Levinson 1980). On 15 August 1995, a lone White-fronted Parrot was observed engaging in head-bowing, neck-craning, and tail-fanning displays in the presence of 20 Red-crowned and Lilac-crowned parrots. In the late summer and early fall, dependent juveniles are present and identified by their begging posture and head-bobbing, while fluttering wings held away from the body. This was accompanied by a distinctive "*uk*" call, which often stimulated adults to feed them by regurgitation.

Parrots in the study area tend to prefer deciduous trees, specifically Sweet Gum (*Liquidambar styracifolia*) and Western Sycamore (*Plantanus racemosa*), during the summer and fall months (Table 2). When those trees lost their leaves in the winter and spring, parrots preferred broadleaf evergreens, such as Carrotwood (*Cupanopsis anacardiodes*), *Eucalyptus* spp., and live oak (*Quercus* spp.).

DISCUSSION

Roost sites and other sites visited prior to roosting tended to have fresh leaf litter beneath them. The branches had marks suggestive of being chewed off by a parrot's bill, rather than being broken or frayed from the weight of a bird or blown off by the wind. The litter beneath roost trees being greater than under other trees suggested this litter was not due to simple shedding by the trees. In areas where parrots roost in Sweet Gum trees, seed pods are often abundantly scattered over streets below. Parrots also tend to strip bark off roost trees. The area under the roost trees is also littered with molted feathers from July to October. Feather lice (Insecta: Mallophaga, Philopteridae) and mites (Arachnida: Acarina) were present on some of the feathers found below the roosts.

It is difficult to ascertain with precision how many parrots used roost sites and to document movements among roosting areas in the absence of banding, marking, and telemetry techniques necessary to distinguish among individuals; experimentation with such techniques has recently been conducted with native Red-crowned (Enkerlin-Hoeflich 1995, Enkerlin-Hoeflich et al. in press) and Puerto Rican (*Amazona vittata*) parrots (Meyers 1995). Estimates of population numbers are rough, at best, and may reflect my ability to detect parrots and an increasing familiarity with parrot habits. Although roost trees camouflage parrots well, parrot numbers can be estimated roughly by counting parrots flying into and out of trees and counting parrots in plain sight, such as when they are on power lines and trees that lack dense foliage.

Mortality among these parrots is not well documented. I found a single Red-crowned Parrot whose death appeared to be caused by being either struck by a car or attacked by a domestic cat. On 8 October 1995, I observed two American Kestrels (*Falco sparverius*) in the vicinity of a roosting assemblage, circling just above the treetops, causing the parrots in those trees to become excited and leave the vicinity. Although the parrots vocalized loudly, I did not observe any direct hostile behaviors by either the

kestrels or the parrots. An unidentified *Accipiter* hawk attacked a flock of ten *Amazona* spp. flying to a foraging area on 4 February 1996, attempting to grasp a parrot. The parrots responded by shifting their flight position from below to above the hawk. They flew close to the hawk, came into physical contact with it, and called loudly. The hawk then flew away, unsuccessful, and did not attempt any further capture.

Night flights of the Red-crowned Parrot are mentioned briefly by Forshaw (1989). I have heard large flocks flying distances of at least a kilometer on several occasions at night. On 3 December 1996, I heard 50–100 *Amazona* parrots flying at 0230 PST. The next day, I heard a small flock (<20) of *Amazona* parrots continuously flying around at 2300–2320 PST. On 5 January 1997, 50–200 *Amazona* parrots were flying at 0149–0152 PST. The reasons for these flights are unknown. I presume that the birds were spooked from their roost by human activity, such as car traffic and passing aircraft, or by nocturnal animals. Fireworks appear to have caused roosting parrots to take flight on 2 July 1997 at 2330–2342 PDT, 4 July 1997 at 2330–2340 PDT, and 5 July 1997 at 0150-0205 PDT.

The rapid increase in parrot populations strongly suggests reproductive recruitment. In the late summer, presumably just after the peak of breeding, at least five to ten percent of the roosting flock consists of juveniles, reinforcing the assumption that the flocks are increasing through recruitment of young and indirectly substantiates their breeding under natural conditions outside of captivity (Mabb 1997).

SUMMARY

Naturalized parrots roost communally in Temple City and adjacent Arcadia, in the San Gabriel Valley of Los Angeles County, California. Parrots visiting the seasonal roost sites from May 1995 to August 1997 numbered as high as 750 on a single day and averaged as high as 625 a month. The parrots tended to use deciduous trees for summer roosting and evergreen trees for winter roosting. Red-crowned Parrots (*Amazona viridigenalis*) dominated the roosting aggregations, but Lilac-crowned Parrots (*A. finschi*) and Rose-ringed Parakeets (*Psittacula krameri*) were also frequently observed. Eleven other parrot species were also observed.

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NESTING BEHAVIOR OF *AMAZONA* PARROTS AND ROSE-RINGED PARAKEETS IN THE SAN GABRIEL VALLEY, CALIFORNIA

KAREN T. MABB, Department of Biological Sciences, California State University, Long Beach, California 90840 (current address: 6213 N. Cloverly Ave., Temple City, California 91780)

Many species of parrot have established populations well away from their native ranges (Enkerlin-Hoeflich and Hogan 1997, Fisk and Crabtree 1974, Froke 1981, Garrett 1997, Hall 1988, Hardy 1964, 1973, Johnston and Garrett 1994, Morgan 1993, Neidermeyer and Hickey 1977, Shelgren et al. 1975). In southern California, at least, several species now occur in what appear to be self-sustaining populations (Garrett 1997). Some of these, particularly amazon parrots (*Amazona* spp.), occur in large flocks and roosts numbering in the hundreds of individuals (Mabb 1997).

The numbers and variety of parrots in southern California have been increasing (Garrett 1997, Johnston and Garrett 1994), and some species are present in such numbers as to suggest strongly that there is reproductive recruitment, rather than repeated escapes or releases of hundreds of parrots (Mabb 1997). There is little direct evidence of breeding because naturalized parrots in California have been largely ignored by ornithologists and bird-watchers. Froke (1981) reported one pair of Lilac-crowned Parrots (*Amazona finschi*) nesting in an old woodpecker cavity in a Blue Gum tree (*Eucalyptus globulus*), two pairs of Red-crowned Parrots (*A. viridigenalis*) also nesting in a Blue Gum tree, and a pair of Yellow-headed Parrots (*Amazona oratrix*) nesting in a Mexican Fan Palm (*Washingtonia robusta*). All of these nestings were in Arcadia and produced young. Residents in Anaheim, Orange County, reported to me that a Red-crowned Parrot nestling fell out of a nest on 26 June 1994. A nestling Canary-winged Parakeet (*Brotogeris versicolurus versicolurus*) was collected in San Pedro, Los Angeles County, California in June 1973 (Garrett 1997). Hardy (1964) reported the first instance of Rose-ringed Parakeets (*Psittacula krameri*) breeding in southern California, and Charles T. Collins collected three Rose-ringed Parakeet chicks from a nest in a tree hollow in Pomona in 1974 (Shelgren et al. 1975, Collins pers. comm.).

In their native range, the Red-crowned and Lilac-crowned parrots are allopatric, with the Red-crowned limited to northeastern Mexico and the Lilac-crowned occurring in western Mexico (Forshaw 1989, Howell and Webb 1995). Two previous studies provide information about *Amazona* spp. nesting in northeastern Mexico (Aragon-Tapia 1986, Castro 1976). Recent study of the Red-crowned Parrot's breeding behavior has shown that the species may nest colonially, with 76 nest cavities used in a 96-ha study area in northeastern Mexico from 1992 to 1994 (Enkerlin-Hoeflich 1995, Enkerlin-Hoeflich et al. in press, Enkerlin-Hoeflich and Hogan 1997). There is little documentation of the nesting behavior of native populations of the Lilac-crowned Parrot.

The Rose-ringed Parakeet ranges through the Sudan belt of Africa from Senegal to Somalia and across the Indian subcontinent from Pakistan to

central Burma and Sri Lanka. Introduced populations are present in Mauritius, Zanzibar, Egypt, Aden, Oman, Kuwait, Iraq, Iran, Great Britain, Hong Kong, Macao, and Singapore (Forshaw 1989, Morgan 1993). Which of the four subspecies that occurs in California has not been documented.

I report here observations on breeding *Amazona* parrots and Rose-ringed Parakeets in the San Gabriel Valley of Los Angeles County, California. My observations were concentrated in the communities of Temple City and adjacent Arcadia. I observed nesting areas from 9 April 1996 to 7 August 1996 and from 27 January 1997 to 15 July 1997 and observed roosting flocks, noting the number of dependent juvenile *Amazona* parrots present, from 15 May 1995 to 16 August 1997 (Mabb 1997).

STUDY AREAS

Location 1

On eight occasions between 9 April 1996 and 7 August 1996, I located at least 10 to 30 *Amazona* nests and four Rose-ringed Parakeet nests in what appeared to be a semi-colonial situation. Because of the difficulty of distinguishing female Red-crowned Parrots from Lilac-crowned Parrots, I merely established that both were present, and refer to them as "*Amazona* spp." On seven occasions between 27 January 1997 and 8 July 1997, I observed two Rose-ringed Parakeet nests and up to 50 *Amazona* spp. in the area, but I noted only the presence of nesting activity and did not attempt to locate any specific nest cavities. All of these parrots were using Silver (= Soft) Maples (*Acer saccharinum*) lining streets in a neighborhood developed in the 1940s near the border of Arcadia and Temple City. Some trees contained more than three nests. In one tree, there were two Rose-ringed Parakeet nests and at least one *Amazona* nest. Frequent tree trimming in this area caused large nodes to form at the end of thicker branches and exposed the heartwood to decay by weathering, insects, and excavation by parrots or other birds or mammals. All of the nests I observed were in these excavated cut-off limbs (Figure 1). Nest heights varied mostly from 8 to 14 m; the lowest was in a tree trunk at a height of approximately 5 m.

I was unable to mark and examine each nest and was thus restricted to casual observations concentrated on those nests that I could readily find on subsequent trips.

Location 2

I observed a pair of Lilac-crowned Parrots nesting in a cavity in a utility pole 9 m high in Temple City. I made observations of this nest on eight different days from 2 April to 2 June 1996. I was unable to distinguish the sexes of the two individuals attending the nest. I also visited this area eleven different days between 31 January 1997 and 15 July 1997; although over 500 parrots were foraging and roosting in the area, I did not observe any parrots using the utility-pole cavity, nor was I able to find any other nests. Sycamores (*Platanus racemosa*) and Silver Maples line the streets in this suburban neighborhood.

Figure 1. Tree containing several nest cavities occupied by *Amazona* parrots in Temple City, Los Angeles County, February 1997.

Photo by John Young

ROSE-RINGED PARAKEET

Two pairs of Rose-ringed Parakeets nested at an approximate height of 10 m in the same Silver Maple at Location 1. An *Amazona* nest was also located in the same tree and at the same height. There were two additional Rose-ringed Parakeet nests in two nearby Silver Maples. In April 1996, I observed male Rose-ringed Parakeets leaving these nests to forage and returning to feed young or a mate. The males rarely entered the nest completely; in most cases they merely ducked their heads into the nest. Upon my approach, the male often performed distraction displays before leaving to forage. These distraction displays included short flights to many perches around the nest and circular flights beneath the tree canopy in the nest area. Both displays were accompanied by loud vocalizations. On 27 April 1996, nine individuals were present in the Silver Maple with the two nests. One, presumably an immature, had a yellow bill; the others had red bills. On 28 April 1996, I observed a fledgling Rose-ringed Parakeet being fed by a male on the outside rim of a nest cavity. After feeding the fledgling, the male ducked his head into the nest and fed other chicks or the female. In May 1996 and June 1996, up to 10 Rose-ringed Parakeets were using the area. Five individuals were present on 23 June 1996, but none after that.

On six occasions between 27 January 1997 and 8 July 1997, I observed two male Rose-ringed Parakeets, each using the same Silver Maple as the one that contained the two nests in 1996. I also observed a female Rose-ringed Parakeet entering a cavity on 9 February 1997.

LILAC-CROWNED PARROT

At Location 2, a pair of Lilac-crowned Parrots aggressively defended their nest, the utility pole, and nearby power lines against Red-crowned Parrots, Red-lored Parrots (*A. autumnalis*), and other Lilac-crowned Parrots. They also chased away American Crows (*Corvus brachyrhynchos*) and European Starlings (*Sturnus vulgaris*). The nest cavity was located on the north side of the utility pole, approximately 1 m from the top of the pole. Directly under the cavity was a wood cross-beam and a transformer drum on which the nesting pair performed many courtship displays, such as tail-fanning, wing-spreading, nape-raising, and pupil dilation (Copsey 1995, Levinson 1980). They frequently engaged in allopreening and in mate feeding by regurgitation. They also shared solid food held in the foot of one individual.

In early April, these two parrots were frequently entering and exiting the nest cavity. They excavated the nest presumably by enlarging a pre-existing cavity. In the evening, both parrots usually disappeared into the cavity approximately one minute before a nearby flock (numbering approximately 350 *Amazona* spp.) settled on their nighttime roost. On 3 May 1996, I heard chicks begging in the nest and saw an adult Lilac-crowned Parrot peeking out of the nest periodically. Another Lilac-crowned Parrot made many short trips, about 5 minutes in duration, to and from a foraging location, returning to put its head in the nest and deposit food to the nest occupants. On 17 May and 2 June 1996, I saw 10–30 Lilac-crowned

Parrots foraging on fruits directly under and around the utility pole, but I could not determine if any were interacting with the nest cavity.

In 1997, I did not observe any parrots using this nest on 12 visits from 31 January to 16 August 1997, but juveniles were present among the roosting flock. On 15 July 1997, I observed a Red-lored Parrot feeding a chick.

RED-CROWNED PARROT AND LILAC-CROWNED PARROT

Between 9 April and 23 June 1996, there were over 50 *Amazona* spp. at Location 1. There were 20 to 30 trees in use, with as many as five individuals per tree readily apparent outside cavities. An average of two to three cavities per tree were either occupied or being investigated. On 9 April 1996, I observed a Red-crowned Parrot emerge from a nest cavity; a Lilac-crowned Parrot peeked out of the same cavity immediately after. The Red-crowned Parrot stayed outside of the nest for 2 minutes and engaged in allopreening and other courtship posturing and behaviors with the watching Lilac-crowned Parrot before leaving to forage. On 5 May 1996, I observed one other such mixed pair. On this occasion, when a Lilac-crowned Parrot arrived at a nest, a Red-crowned Parrot poked its head out. The Lilac-crowned Parrot then entered the nest. It reemerged shortly afterward and flew from tree to tree, vocalizing, in an apparent distraction display. On 11 April 1997, I observed a Red-crowned Parrot × Lilac-crowned Parrot pair exploring a cavity. They also engaged in allopreening and displays outside of the cavity. All other pairs appeared to be conspecific.

On 5 May 1996, I observed a recently fledged chick accompanied by an adult Red-crowned Parrot. The chick fluttered on the ground, and I first assumed it to be an injured adult. Upon my approach, the adult, also on the ground, repeatedly pecked the chick until both took flight. The chick landed several times and was pecked by the adult each time until they both flew to the roof of a house where the chick began begging and was immediately fed by the adult. After that, again prompted by the adult, both parrots flew to an area out of sight on private property.

Nesting activity was noted on 19 May and 6 June 1996. On 23 June 1996, there was little activity at the nests, but eight dependent juveniles and approximately 35 adults were present in the area. After 23 June 1996 parrots were at this location only to forage.

On five visits to Location 1 from 27 January 1997 to 13 May 1997, I noted up to 50 *Amazona* spp. using cavities in the same trees as the previous year. On 11 March 1997, I observed a pair of Blue-fronted Parrots (*Amazona aestiva*) exploring a cavity in a Silver Maple and performing courtship displays near the opening of the cavity. Juvenile Red-crowned Parrots were present on 13 May 1997. There were no *Amazona* spp. present after 8 July 1997.

DISCUSSION

I have observed adult *Amazona* spp. regurgitating into the bills of begging juveniles. From research on captive Yellow-headed Parrots, Hardy (1973)

felt that one could not assume that parrots were dependent juveniles on the basis of observed regurgitation only, as there is the possibility that this might be courtship feeding behavior between adults. Even in the field, however, one can distinguish between feeding-of-a-mate regurgitation and feeding-of-young regurgitation. Juveniles vigorously bob their heads up and down while giving a distinctive "*uk*" call repetitiously before, during, and after feeding, whereas adults being fed do not vocalize or flutter their wings, feeding episodes are brief, and feeding is not persistently solicited. Froke (1981) was also able to distinguish juveniles from adults by using similar behaviors. Juveniles also differ in plumage; their color is more vibrant than the adults' and their wing coverts are edged in pale yellow (Mabb pers. obs., K. L. Garrett pers. comm.), unlike the adults' solid green wing coverts (Forshaw 1989, Howell and Webb 1995). Up to 25 dependent juveniles were present among roosting flocks (numbering 42–500 *Amazona* spp.) from 22 July to 13 November 1995 (Table 1). The following year, up to 50 dependent juveniles were present among roosting flocks (numbering 50–500 *Amazona* spp.) from 26 April to 17 December 1996 (Table 1). In 1997, juveniles were present among roosting flocks beginning 13 May 1997, and I observed over 50 juveniles among a roosting flock (numbering approximately 500 *Amazona* spp.) on 13 August 1997 (Table 1). Estimates of numbers of juveniles are based on observing juveniles present among a large roosting flock and being fed shortly before roosting. The estimates are only approximate because depending on vocalizations can only give a general idea of their abundance. When they are in shady trees and in large numbers it is difficult to see them and distinguish plumage characteristics in pre-sunset light. Also, some juveniles may already be satiated and, therefore, not beg for food. Early in the fledging period, numbers are difficult to estimate because bouts of begging behavior and calling result in rapid response by adults. Later in the season, when the juveniles are approaching independence, the bouts are longer. Dependent young noted early in the season may have achieved independence well before the end of the season and thus may not be counted among the young observed at the end of the season.

Although most of the pairs observed in this study consisted of conspecifics, in at least three cases what appeared to be mixed-species pairs were noted. It can only be assumed that these pairs were of "pure" parental types, but they could have been of hybrid origin resulting from previous hybridization either in the wild or in captivity prior to their escape to the wild. Most individuals observed in this study appeared to be typical of their respective species. There was, however, notable variation in the extent of the red and lilac present on the head of many individuals of both species. Some adult Red-crowned Parrots also had yellow posterior to the red on the crown. Similar phenotypic variation among Red-crowned Parrots has been previously reported in a native population (Enkerlin-Hoeflich 1995).

I chose to make casual observations of nesting activity because I did not want to attract public attention and risk having nests "poached" or vandalized. To more clearly document nesting, nests must be marked, height of cavity and dimensions determined, and contents monitored. Such documentation exists for populations in Mexico (Enkerlin-Hoeflich 1995), and the techniques employed were recently detailed (Enkerlin-Hoeflich et al. in press).

Table 1 Numbers of Total and Fledgling Red-crowned and Lilac-crowned Parrots at Roosts in Temple City and Arcadia

Date	Total parrots	Dependent young
22 Jul 1995	42	2
24 Jul 1995	57	5
1 Aug 1995	135	10
6 Aug 1995	275	20
13 Aug 1995	325	20
17 Aug 1995	525	20
24 Aug 1995	150	10
7 Sep 1995	300	25
10 Sep 1995	450	10
8 Oct 1995	250	10
15 Oct 1995	500	2
13 Nov 1995	500	1
26 Apr 1996	350	2
28 Apr 1996	200	2
5 May 1996	75	5
19 May 1996	200	2
2 Jun 1996	30	2
23 Jun 1996	200	13
7 Aug 1996	200	20
27 Aug 1996	450	30
18 Sep 1996	350	50
24 Nov 1996	500	5
17 Dec 1996	250	2
13 May 1997	50	4
13 Jun 1997	250	7
8 Jul 1997	350	7
11 Jul 1997	350	20
14 Jul 1997	250	10
25 Jul 1997	350	10
13 Aug 1997	500	50
16 Aug 1997	750	35

The rapid increase in parrot populations strongly suggests reproductive recruitment. Evidence of chicks produced outside of captivity has been previously documented in the Rose-ringed Parakeet (Hardy 1964, Shelgren et al. 1975), Lilac-crowned Parrot (Froke 1981), Red-crowned Parrot (Froke 1981, K. L. Garrett pers. comm.), and Yellow-headed Parrot (Froke 1981). Numbers of dependent juvenile *Amazona* in evening roosts clearly increased from 1995 to 1996. The presence of dependent juveniles and nests suggests that the large numbers of parrots observed in the San Gabriel Valley are, at least in part, due to reproduction in the wild. There appears to be an abundance of cavities suitable for nesting. The wide variety of exotic ornamental and fruit trees planted in the suburban habitat supplies adequate food (Froke 1981, Hall 1988). Thus, nest sites may not limit further increases in the parrot population of southern California.

SUMMARY

An aggregation of naturalized Red-crowned (*Amazona viridigenalis*) and Lilac-crowned (*A. finschi*) parrots nested in Silver Maples (*Acer saccharinum*) in a Los Angeles County suburban neighborhood from April to August 1996 and January to July 1997. Four Rose-ringed Parakeet (*Psittacula krameri*) nests were observed among an aggregation of *Amazona* spp. nests. A solitary pair of Lilac-crowned Parrots nested in a utility pole from April to June 1996. Three mixed Red-crowned × Lilac-crowned Parrot pairs were observed; all other pairs appeared to be conspecific.

The numbers of dependent juveniles of *Amazona* spp. in evening roosting flocks observed from May 1995 to August 1997 increased from 1995 to 1996. The number of dependent juveniles in August 1997 was equal to or greater than the number seen in 1996.

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SEASONAL FLOCK SIZES OF NATURALIZED MITRED PARAKEETS (*ARATINGA MITRATA*) IN LONG BEACH, CALIFORNIA

CHARLES T. COLLINS and LISA M. KARES, Department of Biological Sciences, California State University, Long Beach, California 90840

Flocks of naturalized parrots and parakeets are today a common sight in much of suburban southern California (Garrett 1986, Johnston and Garrett 1994). Hardy (1973) reported six species to be commonly encountered, and today that list includes at least 10 species (Garrett 1997, Johnston and Garrett 1994). One of the well-established and common species is the Mitred Parakeet or Conure, *Aratinga mitrata* (Garrett 1997, pers. obs.). There is little detailed information available on this species, even in its native range in the subtropical zone east of the Andes from central Peru south to northwestern Argentina (Forshaw 1989). We present here information on the seasonal variation in flock size of Mitred Parakeets in Long Beach from 1988 to 1995; their food habits are considered elsewhere (Garrett et al. 1997).

METHODS

Our study area was largely within a 4-mile radius of California State University, Long Beach (CSULB), in east Long Beach, Los Angeles Co., and included the campus and parts of the Los Altos and Belmont Shore sections of the city. Mitred Parakeets have been present in this area since before 1980 (pers. obs.). Early accounts were of a small group of perhaps only four to eight individuals, and the population stayed at this level for several years, until a flock of 15 was sighted at CSULB in December 1987 (pers. obs.). Our more detailed observatons were made from 2 January 1988 until 16 December 1995 with a few additional observations being made in November 1996. Observations were made largely on an opportunistic basis, with data recorded on flock size, time of day, direction of flight or, if perched, the type of tree the flock was utilizing and if the tree was also a food source. A total of 422 separate encounters were recorded on field data sheets and transferred to Microsoft Excel spreadsheets for analysis.

RESULTS

The maximum Mitred Parakeet flock size per year ranged from a low of 25 individuals in 1988 to a high of 42 in 1994 (Figure 1). Flocks of 40 to 50 individuals were observed at CSULB on two occasions in November and December 1996 (Collins pers. obs.), but the parakeets were moving back and forth between several *Eucalyptus* trees, and exact flock sizes could not be determined. The largest flocks were consistently observed in mid-winter, when all of the parakeets appeared to be traveling in a single flock. The annual mean flock size was substantially lower (Figure 1), ranging from 9.6 individuals in 1993 to 20.7 in 1991. These lower values reflect the fact that

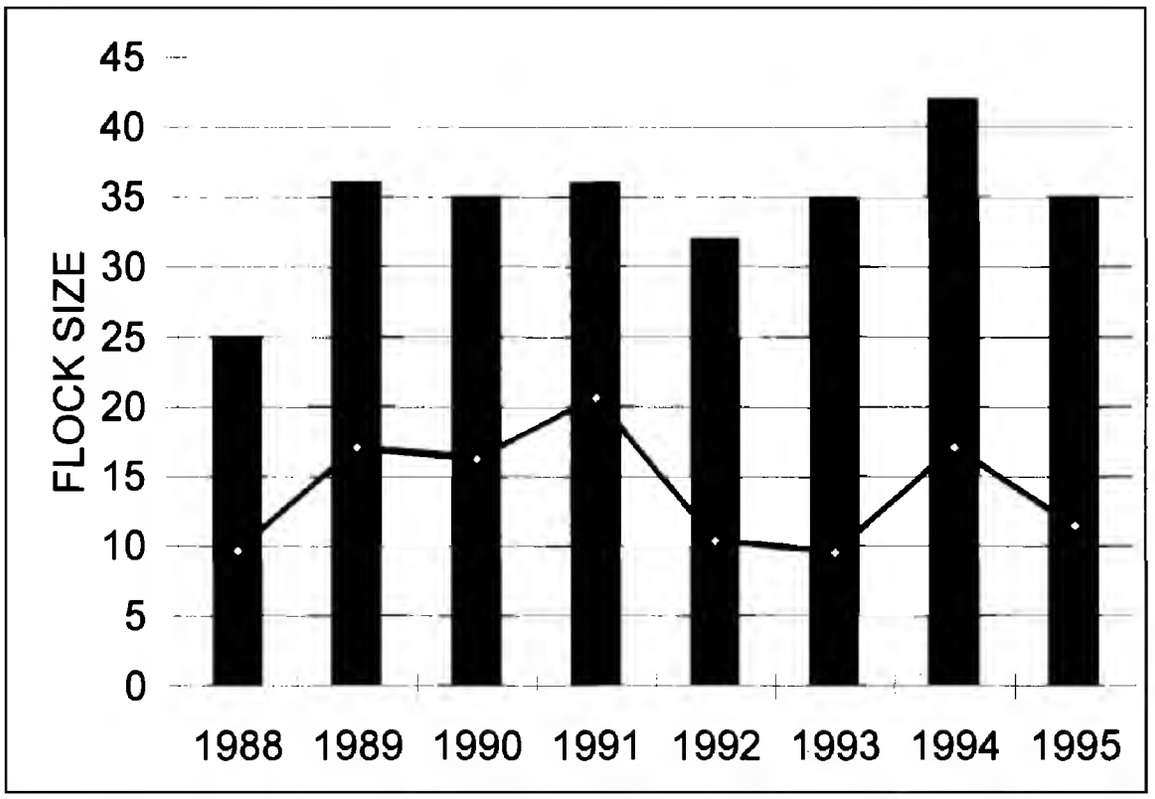

Figure 1. Annual maximum flock size (dark bars) and annual mean flock size (solid line) of Mitred Parakeets in Long Beach, California, 1988–1995.

small flocks my be encountered at all times of the year and that there is a pronounced seasonal change in flock size. Flocks reached their largest size from November to February (Figure 2). By March and April smaller and smaller groups of parakeets were observed. This trend continued until mid-summer, July and August, when there were regular sightings of groups of fewer than five individuals (Figure 2). In these cases it seemed to be one or two pairs loosely accompanied by single individuals that may have represented fledged young. By early fall, the parakeets appeared to aggregate into ever larger groups, reaching peak sizes for the year in mid-winter (Figure 2).

DISCUSSION

The results of this study show that there has been a dramatic increase in the population of Mitred Parakeets in the east Long Beach area over the past 15+ years. Since these observations are of unmarked birds it was not possible to determine actual rates of recruitment or dispersal. Although no nests have been observed, it seems logical to assume that most, if not all, of the observed increases are due to reproduction and recruitment of young into the flock. Unique rasping calls heard from some members of the flock during late fall may have been from fledged young, as noted in *Amazona* flocks by Mabb (1997a, b). Collins observed a copulating pair of these parakeets CSULB in March 1990. The near stability of the flock at a maximum of approximately 35 birds for five years (Figure 1) suggested that some dispersal was occurring. Reports by other observers of Mitred Para-

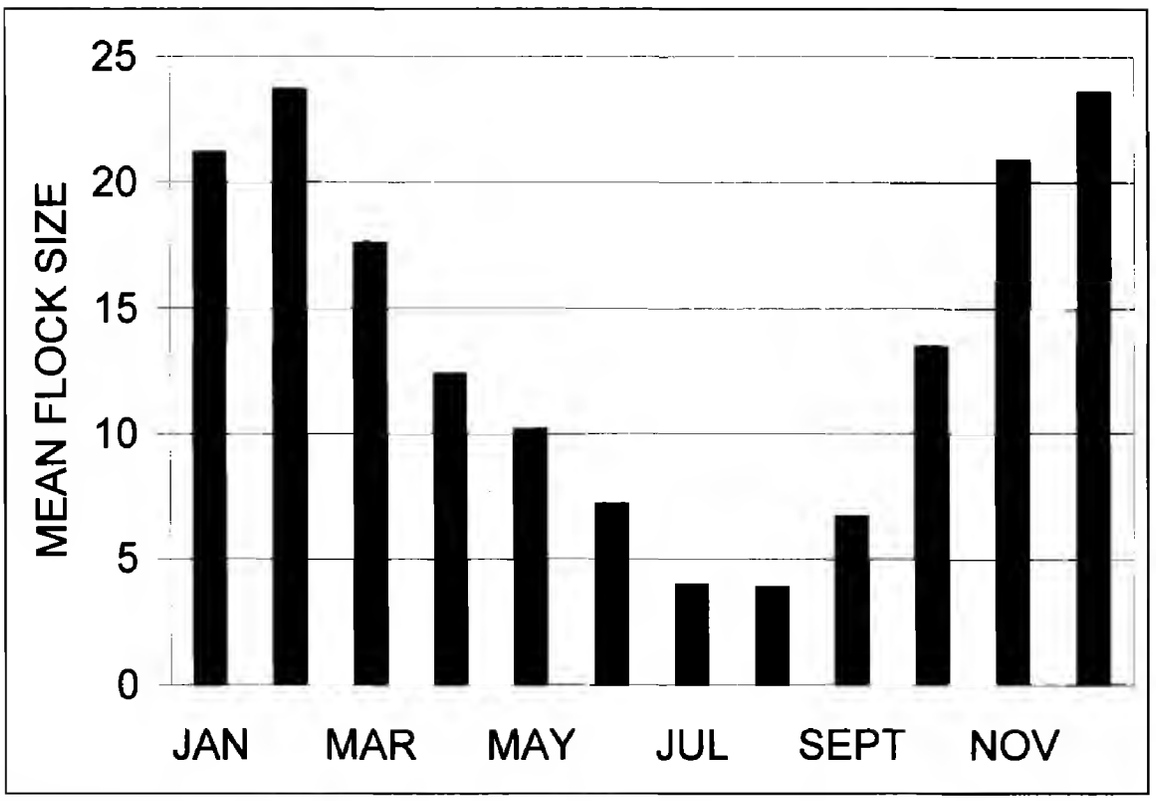

Figure 2. Monthly mean flock size of Mitred Parakeets in Long Beach, California, 1988–1995.

keet groups in areas not far from our study area, e.g., Lakewood Mall, but outside the expected daily foraging range of our study group, tended to support this idea. Details are lacking, however, and dispersal from natal areas and the formation of new flocks remains a topic for future study. Mitred Parakeet flocks have also been reported from such nearby (> 10 miles away) areas as Norwalk, Garden Grove, Cerritos and San Pedro (Garrett 1997, pers. comm.).

A seasonal change in daytime flock size, like that documented here, has also been noted for *Amazona* parrots in the San Gabriel Valley (Froke 1981, Mabb 1997a). These changes have been attributed to reproduction (Froke 1981, Mabb 1997b); large nocturnal roosts are maintained throughout the year (Mabb 1997a). In native environments parrots often form multispecies flocks (Forshaw 1989, Chapman et al. 1989). Large communal roosts may serve as information centers (Ward and Zahavi 1973). The information-center hypothesis suggests that birds congregate in larger groups to facilitate the exchange of information between group members, particularly when food resources are low or clumped and when such information would be most valuable. In Costa Rica, parrot flocks, away from large communal roosts, were smaller than expected during the time of food limitation (Chapman et al. 1989). These authors thought that rapid depletion of smaller clumped resources tended to counter the advantages of larger flocks and resulted in the smaller flocks they observed (Chapman et al. 1989). Some of the foods eaten by Mitred Conures in the Long Beach area, such as *Eucalyptus*, although patchily distributed, are quite abundant and not easily depleted. This would tend to promote the larger flock sizes we observed. It

would be worthwhile, however, to determine if the larger flocks are maintained throughout the day, particularly when they feed on less abundant and potentially depletable food sources.

A majority of the observations reported in this study were made on the CSULB campus where the parakeets made extensive use of the several species of *Eucalyptus* trees planted as ornamentals. They made particular use of *E. sideroxylon* var. *rosea*, which provided a flower and nectar source during the winter months. Observations were also made at a favorite roosting place in a group of approximately 20 palms (*Trithrinax* sp.) near the junction of Ocean Blvd. and Livingston Blvd. in the Belmont Shore area. Kares observed the parakeets leaving this roost between 06:00 and 06:30 shortly after sunrise; they were frequently observed feeding on *Eucalyptus* flowers and nectar at CSULB within about an hour of this time.

Beyond this, the daily movements of these parakeets were not followed and clearly would be worth further study. The impression we got from our observations was that they did not stay at any one foraging location for long, usually less than 30 minutes, before moving on to other spots up to a mile or more away. Their movements were highly variable from year to year, presumably relating to localized food abundances. For example, the parakeets were frequently observed on the upper campus of CSULB during the winters of 1989–90 and 1990–91 when ornamental fig trees (*Ficus nitida retusa*) were fruiting. The parakeets have rarely utilized these same trees since then, probably because of low fruit production resulting from extensive pruning. Similarly, large flocks of these parakeets were observed in the CSULB *Eucalyptus* trees in the late fall of 1996 but rarely during the rest of the winter of 1996–1997. Again, this was presumably due to a shift in the availability of localized food sources and changes in the parakeets' daily foraging patterns to utilize them.

Nearly all of the food sources of these Mitred Parakeets were exotic trees planted in the area, mostly as ornamentals (Garrett et al. 1997). Accordingly, not much foraging competition between these parakeets and native bird species would be expected. Froke (1981) similarly felt that interspecific competition was not a significant factor in his nearby study area. The few interspecific interactions we observed were mostly between the parakeets and American Crows, *Corvus brachyrhynchos*, another species rapidly increasing in the southern California urban environment (pers. obs.). In each case the crow was the aggressor, often chasing parakeets from tree to tree.

The spread of naturalized parrots and parakeets in southern California is viewed with some apprehension, as some species have the potential to be serious agricultural pests. Studies of these free-ranging birds are still in their infancy and much more remains to be learned about the dynamics of these increasing populations.

Note added in proof: A flock of ca. 40 Mitred Parakeets was seen in the study area on 28 September 1997.

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NOTES

LIKELY OCCURRENCE OF OVERLAPPING BROODS IN THE ROCK WREN

JOHN J. WALSH and CARL E. BOCK, Department of Environmental, Population and Organismic Biology, University of Colorado, Boulder, Colorado 80309

The majority of multiple-brooded birds delay several days between the fledging of the first brood and the initiation of a second clutch (Rothstein 1973, Kluyver et al. 1977). Overlapping broods, in which the parents start a second clutch before the first brood has fledged, have been reported for only a few species in North America, such as the Cedar Waxwing (*Bombycilla cedrorum*; Putnam 1949), Rose-breasted Grosbeak (*Pheucticus ludovicianus*; Rothstein 1973), and Cactus Wren (*Campylorhynchus brunneicapillus*; Anderson and Anderson 1960). Overlapping broods have been found in at least nine Old World species including the Great Reed Warbler (*Acrocephalus arundinaceus*; Stresemann 1934), Tree Creeper (*Certhia familiaris*; Vollbrecht 1938), Goldcrest (*Regulus regulus*; Palmgren 1932), Great Tit (*Parus major*; Rheinwald 1971), and Coal Tit (*Parus ater*; Winkel 1975). We report here a likely instance of overlapping broods raised by a single pair of Rock Wrens (*Salpinctes obsoletus*) in Colorado.

We found Rock Wren nests in Gregory Canyon, Boulder County, Colorado. The walls of the canyon are covered with scattered Ponderosa Pine (*Pinus ponderosa*) and Douglas Fir (*Psuedotsuga menziesii*), with an understory of short grass and rock outcrops. Both of the nests were in cavities within the rock outcrops.

When found on 13 June 1996, the first nest contained an unidentified number of nestlings, being fed by a pair of Rock Wrens. On 22 June, four partly feathered young were in it. At 0900 on 25 June, we found a second nest 10 m from the first nest, with the female and an unidentified number of eggs inside the cavity. At approximately 1000 the same day, the first nest fledged four young. Both the male and the female fed the young, which had moved to a nearby rock outcrop. On 26, 27, and 29 June we observed three, four, and six eggs, respectively, in the second nest. The first egg hatched between 11 and 14 July, and five or six young fledged 27 July. At a laying rate of one egg per day (Merola 1994), the clutch for the second nest probably was initiated one day before the chicks in the first nest fledged.

Because the birds were not banded we cannot be absolutely certain that only a single female or a single pair of wrens was attending the two nests. On only two occasions during the summer, however, did we see other Rock Wrens anywhere in Gregory Canyon, and on no occasion were more than two wrens observed near the two nests. The male, which was readily distinguishable from other wrens in the study area by very dark streaking on the breast, had a territory that encompassed both nests. We observed the male feeding fledglings from the first nest on all sides of the second nest, while the female was incubating the second clutch, and he occasionally fed her in the nest. Therefore the two nests belonged indisputably to this single male. The female was observed with the male, feeding the fledglings of the first nest while the second nest was confirmed to be absent of an incubating female. She was then observed heading in the direction of the second nest, most likely to resume incubation. Rock Wrens are typically monogamous (Ehrlich et al. 1988, Merola 1994), but polygyny is frequent among some other wrens (Ehrlich et al. 1988). In either case, overlapping broods or polygyny, we saw family life organized in a way not previously recorded for the Rock Wren.

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CONFIRMED NESTING OF AN INDIGO WITH A LAZULI BUNTING IN KERN COUNTY, CALIFORNIA

SEAN P. ROWE and DANIEL S. COOPER, Kern River Research Center, P. O. Box 990, Weldon, California 93283 (current address of Cooper: Dept. of Earth Sciences, University of California, Riverside, California 92521)

The Nature Conservancy's Kern River Preserve, located along the South Fork Kern River (elev. 2640 feet) near Weldon, Kern County, California, comprises 1100 acres of the largest remaining example of cottonwood/willow riparian forest in California. Since 1986, 320 acres of formerly grazed pasture have been planted with Red Willow (*Salix laevigata*), Fremont's Cottonwood (*Populus fremontii*), and Mulefat (*Baccharis salicifolia*) as part of the preserve's riparian restoration program. The Kern River Research Center has been monitoring breeding birds on the restoration plots and in the natural forest since 1988.

On 28 May 1996, while surveying birds on the Kern River Preserve, Cooper located a female Lazuli Bunting (*Passerina amoena*) building a nest in a small Red Willow. Rowe checked the nest on 31 May and noted that it appeared finished. No adult bunting was seen in the area and the nest was not checked to determine the contents. On 5 June, Cooper noted the female Lazuli incubating two bunting eggs and a single Brown-headed Cowbird (*Molothrus ater*) egg. The cowbird egg was removed from the nest, shaken vigorously, and returned to the nest. While checking the nest Cooper observed a male Indigo Bunting (*P. cyanea*) singing ca. 15 m distant. The female Lazuli flushed from the nest and joined the male Indigo, both calling and flying quickly from tree to tree around the nest as Cooper approached. The male was all deep blue, as is typical of a pure adult male Indigo, and showed no evidence of being a hybrid Lazuli × Indigo. We visited the nest again on 12 June, when only one bunting egg and one cowbird egg remained. Visits on 23 and 25 June found the pair bringing food to a single nestling estimated six to seven days of age (on 25 June) on the basis of pinfeathers just breaking through the sheaths. No eggs remained in the nest. The nest was intact and showed no sign of disturbance but was inactive when Rowe returned on 29 June. With an incubation period of 11 to 13 days and a nestling period of 9 to 12 days (Payne 1992) and from the estimated age of the nestling on 25 June, the young bunting should have fledged between 26 and 29 June. Although the nest showed no evidence of depredation, we were not able to locate either the young or adults buntings on 29 June.

The nest was located on a 20-ha riparian restoration plot that was planted with cottonwood and Red Willow in 1992. Mean tree density on the plot was 268 trees per hectare; mean tree height was 5.5 m with a mean stem diameter of 11.9 cm. Mean canopy cover on the plot was 23%, mean brush cover was 4.3%, and mean forb cover was 54.1% (Kern River Research Center unpubl. data). The nest was placed 2 m above the ground in a fork of a horizontal branch in a young Red Willow approximately 4 m in height. The tree stands in a relatively open grassy area at the edge of the restoration plot among several dozen similar willows spaced ca. 4 m apart. This area differs from the rest of the restoration plot in that the trees are smaller and that there are few cottonwoods, except for several old (50–100 years) ones along the edge of the plot ca. 15 m distant. A heavily grazed pasture is located adjacent to the plot.

The Indigo Bunting has undergone a dramatic range expansion in the southwestern U.S. during the last 40 years (Johnson 1994). The first breeding record in the Southwest was in 1944 near Flagstaff, Arizona (Dearing and Dearing 1946). Indigo Buntings now breed locally in Utah, Arizona, and southern California (AOU 1983, Payne 1992). The first record of the Indigo Bunting in California was of a male collected at Mecca, Riverside County, in 1908 (Thompson 1964). By the 1950s only

a handful of records had been reported in the state. In more recent years, however, territorial males have been regularly reported throughout southern California. The first breeding record for California was of a male Indigo mated to a female Lazuli in Soledad Canyon in Los Angeles County in 1956 (Bleitz 1958). Even with the abundance of breeding-season records of territorial Indigos throughout California, very little has been published on nesting by the species in the state, and we were able to located records of only 15 instances of nesting by mixed or pure pairs (Table 1).

There is some uncertainty as to whether anthropogenic habitat changes have influenced the expansion of the Indigo Bunting into the southwestern U.S. Rosenberg et al. (1991) suggested that the species' invasion of the lower Colorado River valley is, in part, a result of human-induced habitat changes. They cited highest densities of Indigos in recently burned riparian areas where willow and salt cedar (*Tamarix*) have regenerated. Johnson (1994), however, suggested that the range expansion of the Indigo Bunting throughout the Southwest in unrelated to anthropogenic habitat alterations. He reasoned that the Indigo Bunting is using both undisturbed natural habitats as well as secondary growth caused by human activities, and that the habitat which Indigo Buntings currently use was available long before expansion into the region and was much more extensive.

Table 1 Reports of Indigo and Mixed Indigo × Lazuli Bunting Pairs Nesting in California

Year	Male/ Female[a]	Location	Source
1956	I/L	Soledad Canyon, Los Angeles Co.	Bleitz (1958)
1973	I/L	Spring Canyon, near Santee, San Diego Co.	Unitt (1984)
1977	I/?	N. of Needles, San Bernardino Co.	Rosenberg et al. (1991)
1979	I/L	Ukiah, Mendocino Co.	Am. Birds 33:895, 1979
1981	I/I	Morongo Valley, San Bernardino Co.	Am. Birds 35:980, 1981
1982	I/I	Morongo Valley, San Bernardino Co.	Am. Birds 36:1017, 1982
1984	I/?	San Luis Obispo, San Luis Obispo Co.	Am. Birds 38:1063, 1984
1984	I/L	Olema, Marin Co.	Shuford (1993)
1991	I/L	Lake Cuyamaca, San Diego Co.	Am. Birds 45:1162, 1991
1992	I/L	Cajon Pass, San Bernardino Co.	Am. Birds 46:1180, 1992
1992	I\X\L/L	Cajon Pass, San Bernardino Co.	Am. Birds 46:1180, 1992
1993	I/L	Fish Canyon, Angeles Natl. Forest, Los Angeles Co.	K. Campbell (pers. comm.)
1995	I/L	Goat Rock, Alameda Co.	Am. Birds 49:978, 1995
1995	I/L	Whittier, Los Angeles Co.	L. Schmahl (pers. comm.)
1996	I/L	Kern River Preserve, Kern Co.	this study

[a]I, Indigo Bunting; L, Lazuli Bunting.

With respect to California, we concur with Johnson's (1994) conclusion that anthropogenic habitat changes probably played little or no role in the range expansion of the Indigo Bunting. Given the extent of riparian habitat destruction in California during the past 100 years, it seems reasonable to assume that much less second-growth habitat suitable for Indigo Buntings occurs in the state than naturally occurred prior to large-scale human-induced habitat alterations. Although anthropogenic habitat changes certainly influence the distribution of Indigo Buntings on a local level, as on the lower Colorado River and in the Kern River Valley, it seems likely that the ultimate reasons behind the Indigo Bunting's range expansion are unrelated to human-caused habitat modifications.

In the Kern River Valley, the Indigo Bunting, along with a few Indigo × Lazuli hybrids, is an uncommon but regular summer resident, with as many as 20 singing males on territory between early May and mid-August. Highest densities of Indigos in the valley occur between the fluctuating eastern border of Isabella Reservoir and the town of Onyx. Although most territorial male Indigo Buntings in the Kern River Valley use young (<10 years old) riparian restoration sites on the Kern River Preserve or young (<15 years old) willow stands in the draw-down zone of Isabella Reservoir, some (perhaps 20% of the population) use mature cottonwood/willow riparian forest sites with little second-growth habitat. Although Kern River Research Center biologists conduct extensive annual surveys of riparian bird species, including nest searching, along the South Fork Kern River, few bunting nests are located. This is the first confirmed nesting of the Indigo Bunting in Kern County.

We are indebted to Reed Tollefson and The Nature Conservancy for allowing us to conduct research on the Kern River Preserve. Thanks to Helen Green for providing us with northern California reports submitted to *American Birds*. We thank Kurt F. Campbell, Stephen A. Laymon, Christopher Thompson, Philip Unitt, and Pamela L. Williams for commenting on earlier drafts of the manuscript. This is Contribution 14 of the Kern River Research Center.

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